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EDITORIAL.

IT is with much pleasure that we are enabled in this number to give a full account of the transactions of the great gathering of American and Canadian Anæsthetists at Washington. We are pleased not only because it will thus bring our record of Anæasthetic events up to date, but also because at the same time we can demonstrate our fullest interest in the activities of our fellow workers on the other side of the Atlantic.

Anæsthesia, like science generally, knows no frontiers, and it is of the greatest importance to us all that the trend of investigation and research in one hemisphere be quickly brought to the attention of all.

It will be noted that the Congress covered a very large field of endeavour, the programme being fairly equally divided between those who practise and those who work in the laboratories.

The great diversity of subjects brought up for discussion reminds one that Anæsthesia is rapidly out-growing its swaddling clothes, and that it is now quite fit to take its seat amongst the elect of medicine.

A development worthy of mention is the tendency to include in the speciality of Anæsthesia the practice of Inhalation Therapy. Anæsthetists are expert in the handling of oxygen and similar gases, and with their special knowledge of the use of apparatus for this sort of work, there seems no reason why this branch of treatment should not be their proper field. As Drs. Evans and McKesson pointed out in their papers, there are many medical and surgical conditions where this special knowledge may prove useful.

Proceedings of the Sixth Annual Congress of the

ASSOCIATED ANÆSTHETISTS OF THE UNITED STATES AND CANADA AND THE INTERNATIONAL ANÆSTHESIA RESEARCH SOCIETY

Washington, D.C., May 16-17-18-19, 1927

Dr. WESLEY BOURNE, Montreal, the retiring President, in presenting the gavel to Dr. JOHN H. EVANS, Buffalo, new Chairman of the Congress, opened the session. He said: We have come together for our fifth congress, marked with the fact that two years ago the Associated Anæsthetists of the U.S and Canada met as a formative body, one chief object of which was the exercise of cohesion, and to bring together units as well as societies of men and women of our specialty as well as the improving of intimacy of similar bodies elsewhere. Already our societies are ancilliary and bear tribute to this more comprehensive organization; they do so to bring about the complete co-operation in all that pertains to our common good. This spirit is engendered by the unanimous desire amongst us to advance, as much as possible, our important specialty for the good of mankind. It would seem that a great deal has been accomplished during the past two years; the untiring and excellent endeavours of our General Secretary are too well known for me to recount them, but I shall take this opportunity, from such a point of vantage, to express to him our grateful appreciation. Last summer our usual Congress was replaced by a visit to the British Isles as well as other parts of the European Continent, and those of us who made the journey will bear witness that considerable knowledge was acquired from the scientists and anæsthetists and that we were the recipients of bountiful hospitality. There is then a very good bond of union between those of our calling over there and ourselves.

Ladies and gentlemen, it is a very agreeable duty for me to present this gavel to our incoming president, John H. Evans. We all know him so well that I shall not tell of his good works. I flatter myself, however, that I know more than you do about his

personal behaviour, for some careful investigations have been made. I know that his hair was grey long before he was married. He was born in a barn in a farm house as have been many others of our creed. I shall refrain from telling you when this happened as he might not want the ladies to know his age. He spoke Welsh, to the exclusion of all other languages in early life, as many of us learned last summer. Let us be thankful that he has got over this. It was with great effort that he gained his education, largely on account of illness and filial difficulties. He worked at sea and in Cuba for several years and was very fortunate to escape the yellow fever which was prevalent in those days. He put himself through college selling stereoptican views in this city. Since graduating in 1908 he has been hospital interne, ship's surgeon off and on, partly on account of his health ;has been in general practice and then in anæsthetics, combined with surgical work and surgery. He served in the army as captain during the last war. He is connected with two hospitals in Buffalo, the General and the Children's. Now you know the rest at least. You know what he can and does do with oxygen. I submit, sir, it is with the greatest pride, that I present to you this gavel. (Applause).

Dr. JOHN H. EVANS (Buffalo, N. Y.) I am very grateful for the kind words of Dr. Bourne. There is one thing for which I am more grateful, that he did not say anything about my behaviour. In accepting this gavel I trust I appreciate the great honour conferred upon me. I also keenly realize the responsibility that goes with it. I can only hope that with your help and support the same progress will be made during the coming year that marked the preceding year. It will be my endeavour to wield this gavel with the same devotion to the great cause of anæsthesia that has been shown by Dr. Bourne in wielding it so successfully in the past. This gavel, for the past two years, has made its home with our beloved Canadian brothers. There the atmosphere has been such that it has not warped and I hope it has absorbed enough moisture to stand a year's drought.

We will now have the address of welcome by Dr. Kearney.

Dr. H. W. KEARNEY (Washington, D.C.) Our well-beloved Secretary General, Dr. McMechan, in preparing the programme which is to be presented here, thought that inasmuch as I was one of the oldest workers in anæsthetics I would be the proper person to make this address. First of all I want to thank him for the opportunity thus given me. I realize he could just as well have designated someone whose name would have meant more to you all. When these things bring compensation in the form of such honour as we now have of being the first Washingtonian to voice a word of welcome I assure you I do esteem it both a privilege

and an honour. I am not going to mention any case to-day but when, just as many youngest in the grades, I came upon a volume entitled "Memorable Events of our First Century," I found a chapter describing as a great event, the discovery of the anæsthetic properties of ether and the establishment of its use for the relief of pain in surgical operations; the shocking horrors of pre-anæsthetic surgery were portrayed, and the story was told in such a way as to leave an indelible impression on my mind, and ended with the words from Dr. Wendell Holmes who said, "the worst extremity of suffering has been steeped in the waters of forgetfulness and the deepest furrow in the brow of agony has been smoothed for ever." I have the same feeling to-day after years of close contact with human suffering, both mental and physical, in the anæsthetic room, in the operating room, in the delivery room, any where that pain is experienced. Like all the rest of you, I have had to deal with all classes and kinds of individuals,—those who were utterly unappreciative and those whose thanks and gratitude seemed to rest me when I was worn out with fatigue. It should bring us a sense of deep satisfaction, the value of which cannot be estimated. The first fifty years of anæsthesia saw comparatively little progress made; a good deal of work was done in this country and abroad, but unsystematized and misdirected. We realize now that ether and chloroform were not brought to their full by any means. Young medical men with ambition came to look upon anæsthesia as a mere stepping-stone to something they considered better. As a result, interest flagged and the condition of anæsthesia sank. Then came the movement which had its culmination in this Congress. (Applause) We are getting together and, furthermore, we are helping surgery as much as surgery is helping us. This very day on Capitol Hill stands in Statuary Hall one of the most eminent names in this land, Doctor Long. This organization represented here has exercised a potential influence toward the betterment of anæthetics for surgery. I consider it has earned for its members a welcome wherever it may see fit to assemble—in fact it requires a stronger word than welcome. I believe that such a feeling prevails in Washington and I am happy as a Washingtonian in having been selected to convey to you a hearty welcome and a profitable stay in this city. (Applause)

Dr. Evans: I am sure we all appreciate the kind words of welcome and shall feel more at home because of this welcome. The subject of the purity of anæsthetics is one that has been in the foreground of our endeavours to rectify, and for the past year the Bureau of Chemistry of the Department of Agriculture has been doing a great work in their attempt to standardize the purity of anæsthetics so that this purity may be relied upon. Dr. Brown, who

is the head of the Department, is not here but has sent two of his assistants, Dr. Watkins and Dr. Palkin, and Dr. Palkin will tell of the work that has been done in his department.

Dr. S. PALKIN (Bureau of Chemistry, Department of Agriculture, Washington, D.C.): Mr. Chairman, members of the Society: May I, before presenting the paper, extend to you the greetings of the Department officials, as also of the officials of the Bureau of Chemistry, who take more than a passing interest in the activities of organizations such as yours and the American Medical Association, and who, perhaps, more often than you think, look to the membership of the medical profession individually and collectively for clinical *data* and scientific information necessary to form a basis for intelligent enforcement of the regulatory acts with which they are charged.

Dr. S. Palkin then read a paper on "Federal Control of Anæsthetics."

A discussion then took place.

Dr. LUCKHARDT: When Mr. McCarter and I first manufactured ethylene gas for the purpose of using it on animals, to insure the proper interpretation of results we had in mind as one of the constituents carbon monoxide. We took the trouble, in the case of animals, to test for the presence of carbon monoxide. Early in our work at the Presbyterian Hospital we came across cylinders of ethylene which did not have the desired effect and which we soon learned to reject. We finally got the co-operation of Dr. Smith to examine these cylinders. Nevertheless, these were passed through various solutions and among other things were found some of those things which did not serve well as an anæsthetic agent—minute traces of carbon monoxide. It is highly gratifying that the Government takes such interest in this matter and I am sure, in the future, with the co-operation of the manufacturers, they will deliver to the public the highest grade of ethylene. The Department of Mines are certainly to be congratulated on providing the country with a very pure ethylene. (Applause).

Dr. EVANS: I have tried experiments on animals and have assisted in other experiments in which one per cent. or one-half of one per cent. of aldehyde was added to ether. You did see a slight effect of the aldehyde on the heart, on the circulation, but there was no effect whatever on the animal. In other words the anæsthesia went on fairly well and the animal made an uneventful recovery. I have reports of aldehyde administered in Italy. It was found that there was a spasm of the larynx that was undesirable, and it was not found to be a desirable anæsthetic, but there was no death, and while the administration was not considered desirable,

nevertheless, the patient did not die. When we come to consider one and a half per cent. of aldehyde in ether in which there is no expression of any clinical significance it seems to me the prevalence of one hundredth of one per cent. of aldehyde is of little value. It was for that reason that I made my previous statement whether the requirements of the United States Pharmacopœia are reliable or not. No one has been able to give me any information why they set that standard. From a chemical point of view it is all right. In other words, if you are going to have pure ether, we do not wish it contaminated by aldehydes or anything else. I do not believe it is wise to pass judgment as regards the effect of any drug upon a human being from the result found in the laboratory upon an animal. Nevertheless, if we can administer one per cent of aldehyde without having anything happen to that animal either during or after administration, I feel that we are not in a position to say that one hundredth of one per cent. aldehyde or less quantities are of any moment, when we come to anæsthetic ether—therefore I think it up to the United States Pharmacopœia, or anyone else setting such a standard, to show why such a standard is of value to anæsthetists.

Dr. WELLS: I was very much interested in this paper and I am pleased to see the helpful attitude the Government is taking with reference to the purity of anæsthetic gases and liquids but we realize that they are guided by the boundary set by the Pharmacopœia, and the question arises, are the standards set by the Pharmacopœia satisfactory to the anæsthetists, and it seems to me that an organization such as ours should be foremost in investigating and deciding what the proper standard should be for anæsthetics. This is such a tremendous field that it would probably be best to be successful to take one anæsthetic at a time, and, if we can, standardize it. Due to the fact that ether is so widely used, and such a large percentage of the number of anæsthetists in the United States and Canada use ether, it seems to me that perhaps ether should be the first drug so considered. Owing to that fact we should take some action.

I would like to make a motion that the Board of Governors of the International Anæsthesia Research Society be requested to establish a standard of chemical purity and clinical efficiency of ether as an anæsthetic, through a survey of the work, so that the adoption of these standards by science and the Government may be secured for the safety and benefit of humanity.

Dr. HERB: I would like to have the privilege of amending that resolution to include ethylene. It has given me much joy to hear the paper and I do know that this association has taken upon itself the study of anæsthetic agents. When I get hold of a tank that

does not act just right I discard that tank and send it back. I have had those tanks analyzed and Dr. Luckhardt knows I have had ethylene sent back to various companies and they have not given me a very satisfactory reply. However, I am going to hope for a lot from the Bureau of Chemistry.

Dr. WATERS: I think they should control all drugs and we are getting into a way of taking on a big job in attempting to take this upon ourselves, but I think that if Dr. Well's resolution is to go through there is no reason to leave out the others, but if Dr. Wells will make that motion that it would show that we are going to co-operate with the Bureau of Standards I think that would be fine, but I think the Bureau of Chemistry and the U.S. Pharmacopœia should be included.

Dr. WELLS: The majority of anæsthetics given in the country include ether, and we should consider ether first. There are several phases of the situation to be looked into. If the aldehydes and peroxides are harmless to a certain point, or if it is better to have them out, let that be considered, but why can we not establish what is best for clinical anæsthesia instead of letting a Pharmacopœia establish a standard, and when we ask them, they do not know why they have established it. I see no harm in establishing a standard for ether which clinically is best for the patient. What is best for the patient should be final and I think the International Anæsthesia Research Society would be well qualified to take such a stand, as to what is best for the patient, because they have the patient in view, first, last, and all the time, and they are best qualified through experience in laboratory work to decide what that is.

Dr. PALKIN: I know that the Bureau will be extremely interested to know that you have taken any action as a body to recognize these points of doubt in their minds, such as differences of opinion between scientists as regards the harmfulness of these impurities. It is perhaps going beyond my position to state that something has occurred in the industry which makes hypodermic tablets which has a bearing, perhaps, on your organization. In a survey which the Bureau has made, certain conditions have been found that necessitated considerable action, and as a measure of constructive effort the Bureau interested a number of the larger manufacturers who in turn created a committee which they called the Contact Committee, to have co-operate work between the Bureau and the manufacturer, in order to produce information which may be of value to both, and to raise the standard of these products. May I suggest that you will entertain in the course of your meeting, some such idea of creating a Committee which may produce a *liaison*

between the Bureaus. I am quite sure any such action would be welcome.

The resolution was then put to a vote and was carried.

Dr. WATERS: I was going to offer a substitute that we appoint such a committee as Dr. Palkin has suggested and let it take the place of Dr. Wells' resolution. I ask that a Contact Committee be appointed to serve in the capacity of contact between the Bureau of Chemistry and our organization, in the study of anæsthetic drugs, the number to be named by the Board of Governors. Its function shall be to get facts from the anæsthetists of the United States and Canada, to co-operate with the Bureau of Chemistry, Department of Agriculture, to be a permanent committee from year to year along with the other committees appointed, not for one month's work, but from year to year to continue that contact, the committee to function for one year and to be re-appointed each year.

Dr. YOUNG: If we act as a Committee of the Whole, it will never be done; there must be someone responsible for the urging on of this matter in finding out facts and bringing them to Washington.

Dr. WATERS: This is to supplement the working of the previous resolution.

(Upon being put to the vote the substitute was adopted).

STUDIES OF THE RESPIRATORY REFLEX EFFECTS OF ETHER: II. IN RELATION TO URINARY SECRETION.

M. S. DOOLEY, CHARLES J. WELLS,
Department of Phamacology, Surgical Division,
Syracuse University, College of Medicine.

SUMMARY.

IT is common knowledge that irritation of the respiratory tract produces reflex disturbances roughly proportional, within physiological limits, to the intensity of the irritation. We have recently reported to the International Anæsthesia Research Society comparisons of the volatile anæsthetics upon this basis showing that the chloroform and ether types induce marked reflex effects especially cardioinhibitory and vasomotor, whereas nitrous oxide, ethylene, and propylene are almost without such effects.

A phase of this vasomotor reaction, reflex vasoconstriction of the kidney causing anuria, is the subject of this report.

By the simple device of forcing an animal to breathe through a tracheal cannula, the upper portion of the tract can be isolated in order to apply irritant gases to it. These gases may be led through this part by inserting a tracheal cannula pointing upward toward the larynx.

Many reports of "ether anuria" are to be found in the clinical literature. The usual explanation for such has been that toxic effects upon the kidney arise from the anæsthetic in the blood reaching it. Occasionally, circulatory disturbance is mentioned as a possible factor. It is possible for direct action to play a part clinically, but durng our experiments no anæsthetic entered the circulation, yet anuria, of long duration was easily produced. This may occur from a single application of ether or other irritant to the isolated upper portion of the respiratory tract lasting at most only a few minutes.

Ether is more prone to produce anuria than any of the other irritant anæsthetics because the concentration necessary in the respiratory tract to induce and maintain anæsthesia is very much greater, hence the local irritation is more intense. This is the reason ether has come to be regarded as having a specific effect upon the kidney.

That this experimental anuria is due to local irritation and not direct renal damage is shown in other ways. Ether given by the stomach, rectum, or intravenously is without such an effect. Also, cocainizing the upper respiratory tract prevents its occurrence.

Of course, the existence of disease in the kidney would, no doubt, add to the gravity of the situation from the direct action of such drugs upon the kidney. But in general this must be a minor factor.

While it is possible by proper care to avoid anuria even when ether is used, yet it is felt that the results here reported constitute another vindication of the more modern methods of anæsthesia.

Next followed a paper by Dr. JOHN LESHURE, New York City, entitled "Further Observations on the Use of Barbital as a Preventa-

tive of Cocaine Toxicosis," in which the following conclusions were presented :—

1. Barbituric-acid compounds have been demonstrated by both biological and clinical investigations to be safe and efficient antidotes to cocaine, and of this group sodium-barbital, because of its solubility, is probably the most satisfactory preparation.

2. To obtain the most efficient results the drug should be given at least one-half hour before inducing analgesia.

3. It may be combined with a small amount of morphine in selected cases, and may be used preliminary to general narcosis with cocaine epinephrin synergistic analgeso-ischæmia.

4. The dose by mouth is from 4 to 8 decigrams, (6 to 12 grains), but in case of need the drug may be given subcutaneously or intravenously.

ANÆSTHESIA AND INHALATION THERAPY AS COMBINED SPECIALTIES.

By John H. Evans, Buffalo, New York.

Summary.

In the selection of a specialty there should be two outstanding considerations: First is service to the public, and second is that of making a livlihood. When combined specialties are to be considered they should be studied with the view of their relation to each other. Study and experience in the one would be helpful to the other. In combining the specialty of anæsthesia and that of inhalation therapy the two work together for mutual advancement, and therefore to greater service to the public. As many anæsthetists do not have their time fully occupied by their work, the additional revenue from another specialty helps to make also for a better livlihood.

Inhalation therapy is the natural heritage of the anæsthetist, for the study of respiration and the physiology of gases, together with experience in their administration, the handling of compressed gases and familiarity with apparatus, have already qualified him to a certain extent for the practice of inhalation therapy.

The constant study of colour in the administration of anæsthetics has trained him to readily detect slight shades of cyanosis which is an essential asset in applying oxygen

therapy in pneumonia and other diseases where anoxæmia is present.

We have in anæsthesia and inhalation therapy related specialties, the latter the natural outgrowth of the former. They could be considered two phases of the same specialty.

In the practice of anæsthesia the majority of patients are referred by the surgeon, although the time is not far distant when the patient will insist on choosing his own anæsthetist. In the practice of inhalation therapy many patients come directly from the public.

The outlook for the future of professional anæsthesia is bright. The maximum pretection for the life of the surgical patient is bound to win. When the truth is fully known no half-way measures will be tolerated by the patient whose life is at stake. The rapid strides made in the past twelve years under the guidance of our Secretary-General, Dr. F. H. McMechan, has placed the specialty upon a foundation so firm that economic storms will not be able to wreck it.

During the past few years the number of professional anæsthetists in the United States and Canada has increased from four or five hundred to an estimate of two thousand, and international relations have been established with anæsthetists of foreign countries.

The specialty of inhalation therapy is as yet in its swaddling clothes and perhaps it is presumptious to speak of it as a specialty before it has made further growth. However, I feel that you are the ones who are to foster and nourish it and assist in its development.

PRELIMINARY NOTE ON A NEW METHOD OF RECORDING BLOOD PRESSURE WITH PRESENTATION OF A MODEL.

By Daniel R. Barr, M.D., Rochester, N. Y.

Abstract.

The distinctive novelty in the new instrument described (Tycos Recording Sphygmomanometer, Levin patent) lies in the method of moving the kymograph. In the past, the writing surface in this class of instruments was moved at

a uniform rate of speed by a clock works or motor, but in this device, the chart, which is circular, is made to revolve by the collapse of a flexible metal chamber which is in communication with the pressure cuff on the arm. A second cuff placed directly below the other, communicates with an oscillometer to which is attached a pen arm and pen and which traces the curve on the chart. The travel of the chart is synchronized by the pressure decrease in the cuff and the chart bears marginal calibrations indicating the pressure in millimeters of mercury, thus permitting the systolic and diastolic pressures to be read directly from the chart.

The instrument is extremely easy to use and the application no more complicated than with the usual type of indicating sphygmomanometer. The cloth sleeve containing the two rubber cuffs is placed about the arm just above the elbow, care being used to assure the proper placing of the cuffs. Air is now forced into the entire system with a small bulb until the artery is constricted sufficiently to obliterate the lumen. The leak is then opened and the system is allowed to deflate. The chart commences to revolve and the pen traces a smooth line until the oscillations begin to occur in the lower cuff when a spike will be noticed to arise from the line. This will point toward the periphery of the chart and is the index of systolic pressure and corresponds with the first snapping sound heard through the stethoscope in the ausculatory method. As more and more of the artery is opened by the blood column and vibrations increase in size, thus causing longer spikes in the curve until a maximal is reached, when there occurs a more or less sudden diminution and later the pen traces an almost straight line as at first. At the point where the rapidly decreasing spikes show a tendency to become of the same height is read the diastolic pressure. Sometimes one or two later spikes will more nearly coincide with the beginning of the fourth phase as heard when using the Korotkoff method. This will differ somewhat from the point taken at the disappearance of all sound as that occurs much lower in most patients. The criterion of choice is the Ettinger or beginning of the fourth phase.

Serial curves can be run on the same chart up to nine or

ten tracings. To accomplish this the adjusting screw on the pen arm assembly is simply turned through a small arc thus causing the pen to write a new path. Serial curves thus developed are of the greatest interest and importance in anæsthesia. and in experimental psychology.

In judging a set of curves it must be remembered that successive systolic pressure will be somewhat lower in the conscious patient as the psychic effect diminishes and that the diastolic pressure is apt to rise, due to the stasis in the arm distal to the cuff. This latter is minimized if the cuff is re-adjusted at intervals.

The instrument is portable, can be used in almost any position and is extremely rugged. All accessories are packed in the case. Its accuracy is much greater than with indicating instruments and the taking of the tracing can be safely entrusted to the nurse or office assistant.

RESULTS WITH THE DWIGHT-FROST CARDIO-RESPIRAORY TEST IN DETERMINING MYOCARDIAL INSUFFICIENCY

By Allan Eustis, M.D., New Orleans, La.

Abstract.

Results of three years' experience with the Dwight-Frost Cardio-Respiratory Test in routine office work tends to prove that it has distinct clinical value. The original technique of Frost was followed until the past six months, when Steps 6, 7 and 8, only, were used, and these three steps are sufficient to determine the tone of the heart muscle.

Summary.

1. The Dwight-Frost Cardio-Respiratory Test is a valuable aid in the diagnosis of myocardial insufficiency.

2. For this purpose Steps, 6, 7 and 8, of the test are deemed sufficient, and a modification of the original technique to meet the requrements of the anæsthetists is proposed.

3. A poor response to respiratory strain in Steps, 6, 7 and 8, with a falling base line is considered suggestive of myocardial weakness.

4. Case reports with accompanying charts on patients followed over periods of a year or two, demonstrate that the

response to the cardio-respiratory test is in proportion to other definite signs of myocardial weakness.

5. The test should be of value to the anæsthetist in evaluating operative risks.

Phonocardiographic Records in Evaluating Heart Sounds in Relation to Anæsthesia—Dr. JOHN J. SAMPSON, San Francisco

Dr. SAMPSON: What we hear and what we record are not the same thing. It is very well illustrated in a paper by Dodge of the Bell Telephone Company. These vibrations of lower pitch—it takes a lower pitch sound a greater degree of intensity to be heard than a high pitch sound; therefore we record these things electrically as being exactly on the same level, but as we hear them the high pitch would seem louder. In the last few years in the development of electrical vibration there has been a different light thrown on the subject, and in fact the whole science of sound transmission and recording. These advances have enabled the construction of a so-called electrical stethoscope. The first knowledge that I have of such an instrument being used was by Williams, Professor of Physiology of Columbia, who in 1920 used such an apparatus. In 1922 Abbott of Perdue used an instrument, and Richard Gothert (?) of Boston; he and Gamble in Philadelphia have published several reports, and other investigators have published reports.

PHONOCARDIOGRAPHIC RECORDS OF HEART SOUNDS IN RELATION TO ANÆSTHESIA.

ABSTRACT OF REMAINDER OF PAPER.

GRAPHIC records of heart sounds may be made with facility by the combined use of the recently perfected electrical stethoscope and the string galvanometer. By such means we are able to amplify faint sounds and study pitch quality. The personal element of observation, especially in difficult cases, such as rapid rate or muffled sounds, is entirely eliminated.

Those criteria of myocardial damage, such as slurred first sounds, relative valve insufficiencies and certain presumptive evidences of general cardiac damage, such as multiple valve lesions, can be more accurately differentiated in doubtful cases. Records of the sounds in cases with such lesions are presented as an aid in evaluating anæsthesiac risk according to current theories.

Recognizing that certain changes in the dynamics of the heart action during the extraordinary respiratory and circula-

tory strain of anæsthesia occur, records are presented taken during varying degrees of intrathoracic pressure and tension and of cardiac position. It is attempted to determine by comparison of these records and parallel records taken during actual N_2O and O_2 and ether anæsthesias, some of the cardiac changes that may occur under such general anæsthesia.

At this point Dr. Evans announced that the discussion was now open.

Dr. McMechan: I do not feel that Dr. Sampson should feel discouraged that his work has not a broad application. I heard a paper read in Montreal in which it was disclosed that the element of weak heart sound was probably a factor in surgical mortality which was more conspicuous than almost any diagnostic point. Weak heart sounds, whenever put down on the record at the Providence General Hospital, were considered to be of such negligible consequence that they were all classed as extremely good risks for operation. In the records which show heart lesion, irrespective of the lesion,deaths were not over one and a half per cent. in more than one thousand selected cases, but wherever the diagnostic weak heart sound was put down, the results seemed to sum up on the records which were available, the death rate in that series of cases was 12 per cent. as against the normal of four plus, or an average of five, so that it seems to me in evaluating heart sounds Dr. Sampson will disclose something of very great value in relation to surgical risks and anæsthetic risks. I do hope that he will continue his observations, especially in relation to cases submitted as surgical interference after he has made observation through the phonocardiographic records. I am also glad to know that Dr. Eustis has taken up the work of Dr. Frost. Of course it takes time, but after all what is twenty minutes in discussing a bad surgical risk, because if you do not discuss that the patient will be dead a good deal longer than twenty minutes. I feel if there is one branch of research to which we contributed more fundamental knowledge as to the basic physiology of anæsthetics we will probably have to admit this work being done here is the thing which we have profited most from. If we study it more deeply it will have a wonderful application to our work of anæsthesia. Again, I think Dr. Barr is to be congratulated on enabling us to record automatically the blood pressure, to give us a method of recording blood pressure reading and the record can be made without withdrawing much attention from the patient. While the apparatus may not seem applicable in its present form there are such elements of possibility. Further with reference to the presidential address, anæsthesia, after all, began out of the era of pneumatics, and we

had pleasure in Edinburgh last year in being shown a volume written and published by Dr. Bedloe in England, and while some of the remarks which Dr. Evans made to-day may seem startling, back in his day, in the Revolutionary War period, Dr. Bedloe went into these fields and accomplished brilliant results, but unfortunately there was that same anxiety and they thought Dr. Bedloe was meddling with quackery. We also look forward to results from the things which Professor Rowe has originated, problems of anæsthetics in the operating room.

Dr. McKesson: I did not hear all the papers, but we had the pleasure in Toledo of hearing Dr. Evans present, I presume, a similar paper, and since that time it has been my pleasure to see about thirty cases put under oxygen therapy in Toledo. We have had some wonderful results, not one hundred per cent. of course, but so much better than we have had before, particularly in asthma and pneumonia, that it was worthy of note, and worthy of every man's consideration who is giving anæsthetics. Dr. Rowe suggested the use of absorption of Co_2 and the continuous breathing method of oxygen treatment, and I want to say something about that. If you follow that technique you will fail. I will tell you why. If this room were airtight and you had a pipe leading oxygen into it, and we were here breathing oxygen and there was a circuit, before we could get a high concentration of oxygen—and that is the keynote—we should first have to exhaust this room of its air. Now there you have it. The next best method would be to open a window and flush the room with oxygen, and when you do that in a large chamber such as the circular sac, you will have used more than enough oxygen to have offset any saving incident to the absorption of CO_2. Any complicated mechanism necessary to carry out total breathing will be a failure and your patient will be confined in a sac without CO_2. I think the CO_2 absorption method is unnecessary, because it does not save you any money. The cost of oxygen is not great and the CO_2 is unsafe in the hands of people trying to carry out your instructions while you are not there. The best way to get oxygen to a patient in high concentration is to put a mask on him and give him oxygen, not 40 per cent. oxygen but approximately 100 per cent. oxygen. I feel very strongly about this because if we are going to give oxygen and tabulate our results let us be sure we are giving oxygen and not hitting at it.

Dr. Evans: The evening Special Honours Session to-night will begin at 8 o'clock and papers will be read by Professor Arno B. Luckhardt, Dr. Carl Koller, and Dr. H. M. Cohen. We would like to have a large and enthusiastic attendance to show our appreciation and esteem of these big workers in anæsthesia.

Adjourned until 8 p.m.

Prof. ARNO B. LUCKHARDT, of the University, Chicago.
who introduced Ethylene as an Anæsthetic Gas, was presented with the Scroll of Recognition.

SPECIAL HONOURS SESSION.

Dr. EVANS: The first on the evening programme is Professor Arno B. Luckhardt, of the University of Chicago Medical School, Chicago, who will speak to us about "Further Studies in Bodily Reactions under Ethylene-Oxygen Anæsthesia."

BODILY REACTIONS UNDER ETHYLENE-OXYGEN ANÆSTHESIA.

By ARNO B. LUCKHARDT, Chicago.

SUMMARY.

BECAUSE the research work on ethylene was so thorough and exhaustive, and also because in its early use, it was in the hands of such expert anæsthetists, surgeons and specialists, the original reports of these combined experiences need not be modified in any striking particular after four years intensive and widespread trial.

Ethylene may be said to be the anæsthetic of choice in the extremes of life, the young and aged, and that like nitrous oxide, it is devoid of any untoward harm to the patient during administration or after recovery.

At no time have I indicated the mode of action of ethylene and until it can be shown that ethylene interferes with intracellular oxidation by interfering with the transfer of oxygen to the tissues and its utilization I will be loath to accept the explanation along these lines recently announced by Burge. At no time in my personal experiments have I been able to assure myself that any compound of ethylene and hæmoglobin forms which might interfere with tissue oxidation.

In the laboratory we did not encounter the problem of carbon monoxide contamination of ethylene, as has since been the case with commercial production of this anæsthetic. However, there is no instance on record in which all concerned, members of the profession, research workers, organized anæsthesia, the manufacturers and government agencies, acted with such speed and co-operation and effective results,

as in the making the supply of ethylene for anæsthesia virtually carbon-monoxide-free.

The dangers of so-called "ethylene shock" have not been born out in clinical experiences covering thousands of cases. Ethylene, if it does anything, is inclined to stabilize and hold up the circulation, even during long operations.

There is some contention that ethylene may be contra-indicated in hyperthyroidism and may cause "thyroid storm," of a persistent tachycardia followed by death in a few, rare instances. On the contrary, many goiter clinics have turned to ethylene because of the clinical advantages observed and secured. This problem raises the question as to whether ethylene may form ethylene di-oxide in patients who are anæsthetized following the use of Lugol's solution.

I am opposed to any technical procedure in anæsthesia which induces even a partial asphyxia to secure greater relaxation, and have always advocated maximum oxygenation and the use of ether when required.

Dr. EVANS: I will now call on Dr. Isabelle C. Herb.

Dr. HERB: For several months I had heard through Rush Medical students of an anæsthetic gas that was being tested in the physiology laboratory. Knowing that every little while the more or less anæsthetic property of some well known substance was discovered I gave the matter no consideration. One day during commencement exercises a voice behind me in a sort of stage whisper said, "Dr. Herb I wish you would come over to the physiology laboratory, I want to demonstrate the anæsthetic property of a gas I have been investigating."I turned round to see who the speaker was as I did not recognize the voice and was surprised to see the earnest, almost pathetically, eager face of a young man whom I had seen occupying a seat in the college a few years before. You may be surprised when I frankly tell you that my reaction was one of sincere pity—pity because I thought of the disappointment that was doubtless in store for that enthusiastic young research worker. Having laboured in a research laboratory myself and knowing what happiness a little encouragement brings even in face of an almost sure failure and wishing to be agreeable I readily gave my promise to go down to the university providing he would stage the demonstration on Sunday as that was the only day I was sure to be free. Two successive Sundays found me too ill to leave my room, but the third Sunday I was well enough to go. I phoned several surgeons and anæsthetists of the proposed demonstration and asked

them to be present, which they consented to do, and thus it was on March 11th, 1923 that Dr. Luckhardt and his co-workers demonstrated to a group of medical people the anæsthetic property of ethylene. So convincing was that demonstration that three days later I administered ethylene-oxygen to four patients. I think that morning was the most exciting, the most thrilling, the most anxious —and I may add the most satisfactory one in my life. My anxiety was due to the fact that I had no knowledge of the signs of anæthesia to guide me as to the depth of narcosis and I was fearful that I might administer an overdose, while the excitement and thrill were doubtless due to the thought that a new anæsthetic agent was on trail. No one, not even myself, will ever know how many times those same patients were put to sleep and those same operations performed in the following days.

Dr. Luckhardt's presence that morning was a comfort in that it gave me an assurance that ethylene produced anæsthesia under other conditions and it should do so for operative procedures and furthermore he stood with his hand on the valve on the head of the cylinder ready at a moment's notice from me to turn off the gas in case of trouble. I am glad to be able to tell you that our fondest hopes were realized and borrowing the words of a brighter man, "a good time was had by all."

The time has now come when ethylene is no longer on trial. In the short period of four years it has made and will doubtless keep its place among the standard anæsthetic agents of the world and must stand as a living monument to the man who discovered its anæsthetic properties and worked out its effect on body tissues. Not only the individual who requires surgical aid but every surgeon and anæsthetist who loves his art and is striving for better anæsthesia owes this man a debt of gratitude and the associated anæsthetists of the United States and Canada to-night extend to him their kindest greetings and sincere gratitude, and through me present this token of their esteem for meritorious research in anæsthesia. This joint scroll of recognition is dedicated to Professor Arno B. Luckhardt and to Mr. F. B. McCarter, co-worker, for prolonged, untiring and resultful research in anæsthesia.

(Prolonged applause)

Prof. LUCKHARDT: I sincerely appreciate this honour. It was indeed trying at times and I do not believe it would have been pushed across had it not been for the splendid assistance and encouragement I have received from this Society. I have had many rebuffs but have always been accepted as one of you here and sincerely thank you for this honour which you have done me.

Dr. EVANS: The next address will be by Dr. Koller of New York City, "Personal Reminiscences of the First Use of Cocaine as a Local Anæsthetic in Eye Surgery."

SUMMARY.

DR CARL KOLLER gave a detailed account of the circumstances which, in 1884, led to the adoption of Cocaine as a local anæsthetic. He had been experimenting along these lines in the Laboratory for Experimental Pathology of Professor Salomon Stricker in Vienna, searching for a substance which might be used as a local anæsthetic in eye operations. He intended, by making some contribution to Ophthalmology, to establish a claim to an assistantship in one of the large University eye clinics. After some unsuccessful experiments with chloral, bromides, morphine and other substances, he abandoned these experiments. During the summer, 1884, he undertook, together with Dr. Freud, some tests with cocaine internally for the purpose of measuring the systemic effects, its effects upon the muscular strength and the central nervous system. It was in the course of these tests that, noting the numbness of the tongue and the lips (facts already known to physiologists and toxicologists) he realized that here was the very substance for which he had been previously searching, to be used as a local anæsthetic. Hereupon he went to the laboratory, tested a solution of cocaine on the eye, first on frogs and guinea pigs, then on himself and finally on patients. In September of 1884, a communication on the experiments was read for him by Dr. Brettauer of Trieste, before the German Ophthalmological Society at Heidelberg, and later he read a more elaborate paper on the subject before the "Gesellschaft der Aerzte" of Vienna. The news of this finding spread rapidly, and soon a perfect flood of communications on cocaine appeared in the lay and medical press of all countries.

Though making his experiments in the field of ophthalmology, Dr. Koller was aware of the applicability of cocaine anæsthesia to other fields, and it was upon his direct suggestion that Jellinek used it in the nose, in the larynx and the pharynx. A short time later it was used subcutaneously by the surgeon, Woelfler of Billroth's clinic. From this subcutaneous use there has developed, eventually, infiltration anæsthesia, nerve blocking and spinal anæsthesia.

Dr. EVANS: We are honoured in having Dr. Koller with us and telling us personally the way cocaine was discovered. When

we think of anæsthesia we are in the habit of thinking of it in a term of general anæsthesia and we think of the great men who have discovered general anæsthesia, Wells, Long, and Morton and we are quite apt to forget the discovery of local anæsthesia—that is as big an accomplishment and as great an achievement as general anæsthesia. The discovery of the qualities of ether belong to America and the discovery of local anæsthesia comes from abroad, but since 1889 the United States has had the honour of callingDr. Koller a citizen of this country. It is a well-known maxim that birds of a feather flock together, so he has come over here to bless us and to associate with such men as have discovered other anæsthetics. It gives me great honour to present to Dr. Koller this Scroll of Recognition for meritorious research. (Prolonged applause)

Dr. H. M. Cohen, Editor of the *British Journal of Anæsthesia* is next on the programme. He will speak to us on "International Contacts and Publications."

Dr. COHEN: Mr. President, ladies and gentlemen. I am sorry I cannot follow my two predecessors on the platform with an equally scientific discourse but certain thoughts present themselves in relation to this subject, which I hope you will take in good part, although as I say, my remarks will not be up to the high standard set by my distinguished predecessors.

INTERNATIONAL CONTACTS AND PUBLICATIONS

AN ABSTRACT.

IN my opinion, the greatest factor in the continuance of the highly satisfactory relationship existing between the Anæsthetists of America and Great Britain is certainly a common language. In this we have an enormous advantage over other parts of the globe, and it is for us to make use of this advantage whenever opportunities present themselves. We have no faulty translations with which to contend, we do not have to depend upon a third party to interpret what we desire to convey, and there are no difficulties of grammatical construction between us. We both use the same English and all that is needed is the will for that mental contact which is all the more interesting because it opens up to us a world beyond the seas.

We profit in this sort of contact not only by increasing our knowledge of anæsthesia but, what is also a point of great interest, by seeing into the minds of men in another country who work in our own field.

How interesting it is to learn the view and outlook of the anæsthetist who practises thousands of miles away! What are his trials and troubles? Are they like our own? Does the other fellow, for example, also find it difficult, occasionally, to give his surgeon a quiet abdomen? Does the operator wait with cherubic complaisance while he struggles to convert the obstinate intestinal billows into a placid pool?

It is interesting to learn that all such items are a part of the day's work of the other fellow, which perhaps is consoling. (Laughter)

International gatherings are advantageous because of their wider appeal. While it is perhaps true that workers all over the world tackle the more or less same problems similarly, yet in different sections the view-points are no doubt different, and thus varying angles of the same problems are brought to our notice. It may perhaps surprise us that such an apparently simple matter as the effect of ether and chloroform is sufficiently confusing at times because on different continents different results are reported. As is well known, in the tropics anæsthetists find it difficult to rely altogether upon ether, and practitioners there do not understand us when we tell them that in other sections chloroform is rarely needed. Even Great Britain is by no means convinced that chloroform is to be entirely discarded. This, of course, is no doubt due to climatic conditions which render ether slower in action than perhaps on this side of the Atlantic.

These are instances not so much of a difference in view-point as they are in discovery of an actual fact that the one and same drug has differing efficacy in different parts of the globe.

Many similar factors may be brought out by international gatherings, this quite apart from the ordinary announcements and discussions of new advances. The exchange of view-points with practitioners at a distance is bound to broaden and help all of us.

There is another advantage of international contact to which I should like to allude, and that is the stimulus it gives to other workers. When, through the vision of your greatly beloved Secretary-General, Dr. McMechan, it was

decided to make the annual gathering of the British Medical Association, last year, the venue of a visit to Britain by American anæsthetists, a wave of enthusiasm and interest was aroused which made the Nottingham gathering of anæsthetists one of the greatest in English history. The very fact that it was to be an international assemblage brought out the very best that was in us and I am sure the contacts then formed will be of outstanding remembrance for years.

We are hoping, in the near future, to emulate your fine example in this matter by forming an Association of Anæsthetists of the British Empire, and I am sure that with all workers in our specialty thus organized throughout the English speaking world, our art will take its proper place in the world of surgery.

May I just add a word as to the journalistic aspect of anæsthesia? We cannot advance properly without the printed-word. In this matter we also were glad to follow our colleagues in America. The fine example set for us by your *Bulletin* made it comparatively easy for the introduction of the *British Journal of Anæsthesia*, and I am confident that these two publications are valuable mediums for the broadcasting of all that is worth while in our art. Aside from their usefulness in presenting the latest advances to our own supporters, there is the very important purpose of informing the medical world generally, through our numerous exchanges, just what is being done by us in a common cause.

In conclusion, may I again sincerely thank your splendid organization for the great honour you have to-night bestowed upon my associates and myself. I can assure you that it will be a source of a great deal of pride always to know that our humble efforts to advance anæsthesia were rewarded by the bestowal of the Scroll of Recognition.

And may I be permitted to add this final note. The anæsthetists of Great Britain are desirous of keeping in close touch with all of your activities. They appreciate the fine work you have done and are doing to bring anæsthesia to the front as an important specialty, and I can assure this great gathering that your colleagues on the other side are equally keen to do their share in this direction.

Dr. Evans: I would like to call on Dr. E. I. McKesson to present the scroll of honour to Dr. Cohen.

Dr. McKesson: Mr. Chairman, ladies and gentlemen, it was my great pleasure and fortune to be with the group of anæsthetists that visited the British Isles last year about this time, and the first member of the medical profession in England that we met was our good friend Dr. Cohen. He was there to meet the boat, but the boat did not come in; the boat came in the morning after it was supposed to land the evening before, so we missed him when we did land, but he was at the train not to be defeated and we were very very greatly pleased to have made the contact with the Editor of the *British Journal of Anæsthesia* before we began to travel through the country. Dr. Cohen's very courteous and cordial reception of our group of anæsthetists will never be forgotten, and as we travelled to Ireland, Scotland, through England, everywhere we met that same cordiality, that sameness of purpose we have here. It seemed that we were not in any unusual location in the world. I am very sure that everyone felt that he was amongst the very best of friends every minute. In Dublin we received the same cordial reception. In Glasgow and in Edinburgh it was more than a reception in some of those places—in fact I do not think that some of us really remember all that went on. Now we have some impressions. We were looking for differences. We were looking for those things which differentiate our practice from their practice, and I wonder if it will annoy Dr. Cohen if I relate to the members here our impressions. We were impressed with the expertness of the British anæsthetists. In the British Isles every anæsthetic has its place and it is the job to find the particular place where the particular anæsthetic fits best, so that every anæsthetist is an expert in all lines of anæsthesia, and that is a quite marked thing when you go about over the country. They use, and use well, every form of anæsthetic. But Dr. Cohen and his co-workers are serving us in this country as well, doing us a great service in bringing to the world and profession all the information that is worth while, assisting in developing the organization which will favour and forward anæsthesia, and it is on account of this that I have been called upon to present this scroll for meritorious services especially in the interest of anæsthesia. It was our pleasure to see and become acquainted with each one of these gentlemen. (Reads scroll).

Dr. Mechan: I am going to ask the privilege of making the few closing remarks on this auspicious occasion because probably being more or less behind the scenes I am more acquainted than others with some of the things which have led up to these organizations,—something for which these organizations stand, and what they mean for the future. Some years ago a group of us as a result of Professor Jackson's talk at our first Congress of Anæsthetists spent a week with him in his laboratory of pharmacology reviewing

the advances in pharmacology. At that time through the subterranean channels of research we were informed in advance of the public announcement, that Professor Luckhardt and Mr. McCarter were working on ethylene in Chicago, and I can assure him now it was with great eagerness that we waited for the announcement of the result of his researches and also for the results of the clinical demonstration of Dr. Herb and Dr. Lyon at Presbyterian Hospital, and I do not think anyone could have felt more gratified than when we learned that the researches had turned out so well and ethylene was almost overnight established as a new method of anæsthesia. That we did try to stand behind Dr. Luckhardt was little or nothing. It was a clean-cut, wonderful research, and the feeling that we have is that we were wonderfully honoured to be able to have a friend in our midst who could do that sort of job so that we could take out of his hand the torch and carry it on. Professor Luckhardt speaks as though his interest was in other lines. I notice that he still comes to us and I am quite sure that he is going to keep on coming to us. His big toe will trip across something in anæsthesia when he least suspects it, and the University of Chicago will have a great time getting him back to anything else but anæsthesia. It is like the saw-dust in the circus ring to the horse who has been there all his life, so we look to some more brilliant researches on the part of Dr. Luckhardt. Several years ago, in a beautiful address on "The High Spots in the Historical Evolution of Anæsthesia," Professor Leech mentioned to us in Atlantic City that if we really wanted to honour a man who deserved recognition we should consider honouring Dr. Carl Koller for his work in local anæsthesia. The Professor had made a story of the matter and we found also it was one of those clean-cut pieces of work which demanded and should have recognition. Fortunately for us Professor Leech had known Professor Koller from boyhood. This honour has really been long delayed in being given—not on our part. It seems to me that the medical profession of the world over might, since 1884, have found innumerable occasions on which to confer even a more signal honour than we have conferred to-night. I think one reason that such honours have not been conferred is due to the modesty of Dr. Koller. I must frankly confess it took all the persuasive ability of your General Secretary to persuade Dr. Koller to allow himself to be honoured but I feel manifestly pleased that for once in his life he has risen above this feeling of modesty and has come in his friendly way to be among us and has honoured us supremely in allowing us to recognize his meritorious research. Again, I wish to stress Dr. McKesson's first impressions of England. England will for ever mean the welcome that was accorded us by Dr. Cohen. We were simply made to feel at home, and from the moment that Dr. Cohen extended us that welcome, that welcome reverberated

throughout the British Isles, and all politics and religion could not change that welcome in Ireland. I think that one of the things that impressed us most in the British Isles was that while we met anæsthetists after anæsthetists whom we had never laid eyes on before, they knew us and we knew them. When we walked into the clinics and the anæsthetists came forward to shake hands with us, it was like brothers, separated for years, having the same ties of kindred, meeting after that long lapse of time and I feel assured of that now that Boyle and Mennell have recently visited us, and I feel there is going to be a great many more contacts. Dr. Cohen has mentioned the influence of the meeting at Nottingham. The welcome and entertainment we received in Nottingham was overwhelming; the manner in which the old London Society entertained us, and the programme they gave us was remarkable. Although we had never met any of the Scottish anæsthetists, by the time we had one demonstration and were in the middle of the dinner,we had our arms round each other and were all singing Scottish songs and one member was on the table with the decanter. in one hand and singing all the war cries of the Scots. One thing, we are going to go on becoming more friendly and more resultful as time goes on. Here you have Dr. Cohen coming to the American Medical Association as a delegate, as a representative of the British Medical Association. Dr. Flemming follows him as a delegate to the Canadian Medical Association and as a delegate to the anæsthetists in Toronto. Dr. Cohen speaks of an Association of Anæsthetists of the British Empire. Several have sat at my bedside discussing the next meeting of the Australia Conference of Medical men. The suggestion was made that representative anæsthetists in the British Isles and Canada and the United States, in South Africa, in the ends of the world, come to Melbourne in 1930 and hold a conference of anæsthetists there. Fortunately, we met Dr. and Mrs. John Bull. Dr. John Bull is president of this Congress which wil be held in Melbourne in a few years. Before parting with these interesting people we had to pledge ourselves and give our word, with no thought of not keeping the promise, that a group of anæsthetists be present at that Melbourne conference. Again, the British Medical Association will in all probability come to Canada in a few years. We have the prospects of an International Congress of Anæsthetists in Winnipeg. With these prospects before us you can readily see that the mustard seed fell on fertile soil. There is an expression by an anonymous author in which he says, "the greatest thing ever achieved in the world was something done by one man and a group of twelve apostles," and when I read that I looked back into our now almost forgotten history of anæsthetists and it seems to me that out of a group of anæsthetists that you could have counted on your fingers we now behold this international development,and we

For
Meritorious Services
to the
Specialty of Anesthesia

THIS Joint Scroll of Recognition is dedicated by the International Anesthesia Research Society and presented with appreciation to the

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as a token of esteem for their initiative and resourcefulness in founding and publishing this Journal for broadcasting the latest advances in anesthesia and analgesia throughout the scientific world: and making them available not only for clinical use, but also as a permanent source of reference for progress in research, teaching and perfecting of hospital service.

In acknoledgement of which the Officers of the Board of Governors of the International Anesthesia Research Society have hereunto affixed the seal of the Society and their signatures, this ~~ sixteenth day of May, A.D., nineteen hundred & twenty-seven

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think of the thing that we are parts of here, that we are not waiting for men until they have passed beyond to show our appreciation of what they have done, and the thing that tingles in our heart-strings to-night is that we have Dr. Luckhardt with us, and Dr. Koller, and Dr. Cohen, so that we can show them that recognition which we assure them comes out of the fullness of our hearts, and that we are glad to show it to them while we have them here before us.

Adjourned until Tuesday, May 17, 1927, 9 a.m.

THE ADAPTATION OF THE HEART TO TOXIC CONCENTRATIONS OF ETHER.

By McKeen Cattell, M.D., Ph.D.
Department of Physiology, Cornell University Medical College.

Summary.

Observations were made on the effect of a weak ether concentration (0.5 per cent) on the activity of the isolated frog heart. Measurements were made of the rate, output and amplitude of contraction before, during and after perfusion with the ether solution. Within the first minute of ether perfusion there is a reduction of about 1/2 in the height of concentrations and the per minute output and a marked diminution in rate. While perfusion with the ether solution is still being continued, the activity of the heart gradually recovers so that in the average case the performance has returned nearly to normal at the end of ten minutes, demonstrating a definite adjustment to a concentration of ether which was initially toxic. On changing the perfusion fluid back to unmodified Ringer a further change of interest is recorded. The rate per minute output of the heart and the amplitude of contraction are now considerably greater than they were at the control period immediately before perfusion with ether was started. The maximum effect is recorded in the first few minutes after removal of the anæsthetic, following which there is a gradual subsidence to normal.

An acquired tolerance on the part of the frog heart has also been observed toward other depressant drugs, notably during perfusion with cinchona alkaloids. Frequently, but

not always, there occurs a transitory depression of cardiac activity immediately after perfusing with a weak solution of the drug. Such an effect has been observed for quinine, quinidine, chinchonine and cinchonidine in very weak concentrations—about one part in a million of Ringer's solution—and also during digitalis action.

RECOGNITION AND MANAGEMENT OF CARDIO-VASCULAR SURGICAL RISKS.

By Albert E. Phelps, Brooklyn, N.Y.

Summary.

In appraising cardio-vascular risks a clear conception of heart failure and its early recognition are essential.

The importance of sex in the cardio-vascular risk cannot be over estimated. Subjective symptoms and objective signs in men referable to the circulatory system indicate an impairment of that system much more serious in nature than do the same symptoms and signs in women. The cardio-vascular system of the female will withstand more strain than the symptoms and signs indicate, whereas the circulatory system of the male will stand less strain than the symptoms and signs indicate.

Adequate supporting measures may enable an impaired cardio-vascular system successfully to withstand the strain of an operation, whereas without this support progressive circulatory failure would be inevitable. The duration of the operation is also an important factor. The rapidity of the surgery in these patients determines to a large extent its efficacy.

The chief cause of circulatory failure in shock is the reduced volume of blood returned to the heart. Transfusion is the best means we have to prevent and combat circulatory failure incident to surgical shock. Transfusion aids materially in maintaining a normal diastolic volume through adequate venous return, and likewise prevents marked changes in arterial resistance.

To employ an anæsthetic throughout long operations regardless of the nature of the risk is both unwise and unnecessary. During the latter part of a long operation a combination narcotic is substituted for the general anæsthetic. For this purpose morphine, 1/6 to 1/4 grains (10 to 16 mg.), hyoscine, 1/50 to 1/100 gr. and atropine, 1/150 gr. (0.4 mg.) are administered hypodermically. In an abdominal operation of two to two and a half hours the last hour or hour and a half requires no general anæsthetic when a combined narcotic of these drugs are employed.

A poor risk requires absolute rest. Any exertion after a severe operation on a patient with cardiac impairment may prove fatal. The return of consciousness of all patients is accompanied by movements of the arms and legs at times sufficient to require restraint. This exertion may be prevented by administering, hypodermically, ten to fifteen minutes before the close of the operation, the combination narcotic previously mentioned. The patient passes into a deep sleep that lasts from four to six hours. Even transfusion after the operation fails to awaken him. Absolute rest is assured.

To maintain a narcosis, however skillfully, is not our only function. We must possess, also, a knowledge of the condition of our patients. A knowledge that embraces the amount of strain a patient can successfully withstand is also necessary. We as anæsthetists are in a position to obtain this knowledge. Its acquisition is our privilege and our duty.

CONTINUOUS BLOOD AND SALINE TRANSFUSION DURING OPERATIONS ON POOR CIRCULATORY RISK PATIENTS.

By Harry J. Shields, Toronto, Canada.

Summary.

Patients dying within 36 hours of operation, with no error in surgical technique or judgement, or any post-operative complication other than depression, may be considered as the type of "poor circulatory risk" patients who raise the problem of being properly safeguarded and tided over for recovery.

Poor risk patients withstand the average loss of blood and usual shock of operation very badly, and both are more apt to be severe in such patients than in more normal. Lack of oxygenation and tissue oxidation through lowered hæmoglobin, lessened blood volume and the effects of shock on respiration and circulation are rapidly fatal. The period of crisis for their occurrence is during the operation. If the patient can be sustained *during* the operation, recovery is usually assured.

Saline, by the drop method; intravenously; direct blood transfusion, and transfusion of citrated blood are available methods. The first and last are the most practical.

A falling systolic pressure and a rising pulse rate determine the necessity for interference. Our plan is to fix a systolic pressure felt to be most suitable for each patient and by intravenous saline or blood transfusion keep the systolic pressure at that level.

The speed of transfusion is quickened as the abdomen is opened; abdominal contents manipulated; in the presence of hæmorrhage, and when the abdomen is being closed. In such changes citrated blood transfusion is easier and more practical than syringe injection.

Except in anæmia, almost any quantity of saline may be given, provided the limitation is based on bringing the systolic pressure back to within 10 mm. of its previous level. In anæmia and hæmorrhage, blood transfusion works best.

Transfusion before operation may not outlast the strain of the operation procedure; transfusion after operation may be too late, hence its use during and throughout the entire operative period.

Blood that is lost by hæmorrhage may be used by the citrate method, under proper precautions.

Discussion.

Dr. Mc Kesson: Dr. Shields' paper interests me very much as I have done some considerable amount of such work myself. There is no logical method because of the situation we have in the operating room. It is not convenient, to say the least, to administer whole blood; the next best, of course, is to drain it, but we know that we have to have some reactions which are practically nil with the whole blood. From my experience in the operating room, saline made up haphazardly is not isotonic to a nicety. If you are putting

in large quantities of saline there should not be any question about the saline. For that reason we should be careful about the quality of saline. As to the amount of saline, I don't know how much should be used. I have never seen any bad results from the use of saline which is isotonic. We start our saline going well before operating. There is very often delay in getting saline so that if you start the anæsthetic before getting the saline under way you may get into trouble in ten or fifteen minutes and in the midst of the operation lose the patient. I have put in up to 100CCs. a minute, and from that amount down depending on the requirements of the case. I think we all appreciate the difficulty in hospitals. Most of us are working in various hospitals, and when we call for saline there is no one there to give it or if someone is sent in they are inexpert, and it is just in the cases where we need saline it is most difficult to get. So that we should bring home to the hospitals this thought. The hospital is a work-shop for the patient and if the procedure is as important as this is not only in the operating room but in these departments there should not be any question about getting the proper personnel to do these things when we are in trouble People should be there who are trained in the introduction of saline in blood; someone should be available who can really give it properly. I feel that we should stress that in the hospitals. I know from my own experience that we have a good deal of trouble in getting these things carried out.

Dr. EVANS: I know, in Buffalo, when we call for saline it is sometimes twenty minutes before the saline is ready and occasionally they bring it in and leave it in the corner somewhere, and as Dr. McKesson has said—time is important.

Dr. HARDING: I would like to ask Dr. Shields if he always gives this intravenously, and if he is guided entirely by blood pressure?

Dr. STEWART: I want to ask those who give the blood from the abdomen what effect the squeezing out of the sponges has on the character of the blood. Is it added to the saline?

Dr. LONG: It is our practice in bad risk cases to transfuse blood and saline before the operation starts. We use a small cannula which is inserted into the vein and left there for days, and we thus have a continuous drip into the vein. The thing Dr. McKesson has said is something I had brought before me at home many times. That is, in every hospital, the emergency saline transfusion by hypodermic process is frequently found not to be in working order. Can you, within two minutes from the time you ask for it, have at your hand, properly working, completely ready, equipment for intravenous use. If not, something is wrong with your operating room staff,

something wrong with your equipment. The emergency staff, like fire-fighting apparatus, which is also life-saving, should be ready at all times. There should be someone who is responsible for having it ready at all times. When we should really be giving a transfusion, it is ten or fifteen minutes before you get it going, if at all.. They apologize in the hospitals by saying the service in the operating room is such that they cannot get the team capable of giving good work, or, if they have such a team, it is not long before they are gone and they have to break in a new team. That is an excuse but it is not adequate. The fact remains, life-saving procedures should be ready at all times. It should be someone's business and there should not be any reason why such equipment is not available for efficient operation when called for. As a matter of fact, someone should be appointed and made to inspect it every morning and see that it is in good working order in case it is called for.

Dr. SHIELDS: In answer to Dr. McKesson as regards reactions; they do occur with citrated blood; our patients, of course, are of all types. If the blood suits I do not know why there should be any more reaction. There is, of course, but I have never seen a bad reaction with citrated blood. As far as saline goes, all I know is that saline is made up freshly. It has never been tested out against blood test as far as I know. I think everybody has the same experience about starting intravenous action. It always takes time. I am like Dr. McKesson, I will not let them commence the operation until we start things running. These sets are made up and wrapped in a towel; all they have to do is to open it and put in the saline. I like to see the saline running before we start the operation. My experience in these cases is you might as well cut down on the vein. So often the house-men are sure they can get into the vein. We do a lot of blood transfusion in our section of the country. With infants and children we transfuse as we go along in case of shock but we can give them a greater amount of blood than we can an adult. They are doing it so much there that we can very well turn it over to the house men. They do it so frequently that they can do it quickly, and very well. A gum would be better if we could get it without reaction, and we could get along with a lot less fluid if we could get a gum.

In answer to Dr. Harding, what we do is only to give it intravenously in cases which are likely to be bad ones. I usually get a house man to place the needle in for me, and after that it is under my own control. We only do it in cases which are likely to need it. I hope to use it more often than we do.

As regards Dr. Stewart's question of the blood taken from the abdomen, I would think blood squeezed out of the sponges about the same as normal blood. As a matter of fact, we very frequently

Prof. RALPH M. WATERS, of the University of Wisconsin,
President-Elect of the Associated Anæsthetists of the United States
and Canada.

put some hot saline in to warm it up a bit, but as to whether or not the corpuscles are whole I do not know, but I know it helps the patient a lot better than saline.

Dr. McKesson: How rapidly do you give it?

Dr. Shields: As rapidly as the patient seems to need it. I suppose, 100CCs. in a minute. Those patients have a low blood volume. The faster we give it the better it is for them. I do not think there is any question about that.

Dr. Long: Do you consider the possibility of infection? That possibility would not be sufficient to make it preferable to use saline if you are sure of your blood. I do not think you can be sure of blood taken from the abdomen.

Dr. Shields: It might occur. However, it has to be done. It is a proceedure which is performed very commonly. There have been a good many men who have adopted it during the past several years and I have never seen or heard of any trouble. I think it is possible. I dare say that the blood will take care of a small amount of infection anyhow, but I have never seen the slightest trouble, even any rise of temperature which might be put down to blood introduced in that way. The blood should be filtered through gauze. In every hospital if you wait for saline until you need it it will be a matter of several minutes, but if you have all these things ready it helps to avoid delays. As I have said, I like to have it started before the operation is begun.

Dr. Evans: I think if we all carried a little equipment like this it would save a good deal of trouble and time. If you select your own needle and have everything sterilized and have some one to give it, you are ready.

Adjourned until 2 p.m.

SYNERGISTIC ANALGESIA IN LABOUR AND OPERATIVE OBSTETRICS.

By I. H. Noyes, M.D., F.A.C.S., Providence, Rhode Island.

Summary.

Much credit is due to Dr. J. T. Gwathmey and Dr. Asa B. Davis for evolving a new mode of treatment which has been used successfully on several thousand patients at the New York Lying-in Hospital.

The writer practised their method as follows:—

A soapsuds enema on admission, if in labour.

An intramuscular injection of 2 cc. of 50 per cent magnesium sulphate solution with morphine $\frac{1}{4}$ gr. when the patient begins to complain, provided the cervix is two or more fingers dilated and strong contractions are occurring at least every five minutes.

A second intramuscular injection of magnesium sulphate solution without morphine half an hour after the first.

If the first two injections produce a sedative effect, the rectal instillation is not given until the contractions are again strong and recurring every three to five minutes and the patient is again complaining of pain. When there is no apparent relief of pain, it is given twenty to thirty minutes after the second injection.

Immediately after the instillation another injection of magnesium sulphate without morphine is administered.

When giving the instillation, place the patient in the Sims position and apply vaseline around the anus. Fill the large catheter to be used with fluid petrolatum or olive oil and insert it a sufficient distance into the rectum. Then inject slowly the warmed instillation mixture which contains quinine (alkaloid) 20 grains, alcohol 45 minims, ether $2\frac{1}{2}$ ounces and either liquid petrolatum or olive oil to make 4 ounces. Remove the catheter and maintain pressure on the perineum with a pad for ten minutes.

One difficulty encountered was the introduction of the catheter beyond the presenting part when the head was low in the pelvis. If the gravity method of introducing the instillation is employed it is less likely to be forced out around the tube and lost. It was wholly retained in 80 per cent. of the cases.

The preliminary injection of morphine and magnesium sulphate gave partial relief of pain in 85 per cent. Uusally, it was not necessary to give the instillation for about two hours after the second injection of magnesium sulphate. When retained, this gave at least temporary relief of pain in practically all cases.

If delivery takes place within two hours after administering the instillation, the analgesia will usually be satisfactory. In two instances the instillation seemed to slow down labour and stop progress. These patients were

ultimately delivered by forceps, one without any inhalation anæsthesia and, though apparently in pain at the time, she could recall nothing about it twenty-four hours later.

If the effect of the treatment wore off before the completion of the second stage, the instillation was not repeated as it is at the New York Lying-in Hospital, but the delivery was usually completed under gas-oxygen analgesia.

There were no stillbirths and no cases of serious asphyxia. The third stage was not altered and there was only one case of post-partum hæmorrhage.

Patients subjected to this technique should be closely watched both by medical and nursing staffs. Knowledge of existing conditions are essential in choosing the time of the first injection and again when the instillation is given, after which they must be under constant observation. The general condition of the patient, the fœtal heart tones and the progress of labour should be frequently noted. Successfull results can not be expected unless strict regard is accorded to all details.

FURTHER EXPERIENCES AND RESULTS WITH SACRAL ANÆSTHESIA IN OBSTETRICS.

By S. P. Oldham, *Owensboro, Ky.*

Summary.

Caudal anæsthesia is more to be desired than presacral or transacral, because of the simplicity of its administration. Having used this technique in upward of five hundred cases I believe it to be safe, durable and without hazard to either mother or child.

Sequella are practically nil and with the addition of quinine salts the anæsthesia is sufficiently prolonged to terminate either operative or instrumental delivery.

Caudal anæsthesia produces marked relaxation of the inferior portion of the birth canal and perineal tears are less likely to occur; does not impair tonicity of the uterus. The placenta separates normally and post-partum hæmorrhages are not to be expected.

It can be used more extensively than general anæsthetics in that it is not contra-indicated in cardiac, pulmonary and

renal pathology. It is available, non-toxic, inexpensive and is as serviceable in the home as hospitals; does not require an assistant or an expert anæsthetist for its administration. The mother remaining conscious, fully co-operates with the obstetrician. The head is allowed to pass over the perineum *ad libitum*.

Formula No. 1 consisting of

Procain	30 cc. 1% Sol.
Epinephrin	1/1000

proved a disappointment, in that the duration of the anæsthesia was too short in primipara, requiring a second injection.

Formula No. 5 consisting of

Magnesium Sul.	2 cc. 50% Sol.
Procain	30 cc. 2% Sol.
Quinine & Urea	6 cc. 6% Sol.

was discarded because the contrations were entirely arrested and were re-established with difficulty due to the muscular relaxating effect of the magnesium sulphate.

In a few cases Formula No. 7 consisting of

Magnesium Sul.	2 cc. 50% Sol.
Procain	30 cc. 2% Sol.
Quinine & Urea	6 cc. 10% Sol.

was used, believing the oxytoxic effect of the quinine salts would overcome the relaxing effect of the magnesium sulphate, thus far no discernable effect has been noticed.

The modified Formula No. 4 consisting of

Procain	30 cc. 2% Sol.
Quinine & Urea	6 cc. 3% Sol.

has proved very desirable in my hands, meeting every requirement and of sufficient duration to terminate any delivery.

There may be some objection to the use of quinine and urea because of the tendency to slough, but experience has lead me to believe that if the solution be stable and sterile, sloughing will not occur.

Caudal anæsthesia will not be employed in every case

of parturition. In selected cases the result is very gratifying —like other anæsthetics it is not a hundred per cent efficient. Perfect anæsthesia can be obtained in about eighty five per cent.; anomalies are present in the sacral canal in about ten per cent., consequently fifteen per cent. failures, should not bring this technique into disrepute.

SPINAL ANÆSTHESIA FOR CÆSARIAN SECTION IN THE TOXÆMIAS OF PREGNANCY.

By G. N. Astley, West Philadelphia, Pa.

Summary.

The successful treatment of toxæmia developing during pregnancy, must have two objects:—(1) The reduction in the response of the organism to the toxins already present; and (2) the ultimate termination of pregnancy with a living mother and child.

In toxæmias or eclampsia, delivery, at or near term, must be affected with minimum shock, no traumatism on account of the danger of infection; under anæsthesia that adds no further burden to the liver or kidneys; and with a living child, if it is to be considered successful.

Again for the child's sake, delivery must be rapid to safeguard life, without injury to the premature child, and without the use of drugs that might cause intrauterine asphyxia or difficult resuscitation after birth (morphin).

Cæsarian section under spinal anæsthesia seems best to meet all these conditions:—

1. Spinal anæsthesia provides the pain relief, relaxation and absence of shock needed for rapidly emptying the uterus.

2. It adds no further burden to overtaxed liver and kidney function.

3. It lowers blood pressure and thus lessens the danger of hæmorrhage.

4. It lowers the cerebro-spinal fluid pressure.

5. It secures a quiet operative field should convulsions develop during the course of operation.

The method and formula for spinal anæsthesia is that of Dr. W. Wayne Babcock:—

Stovaine	0.08
Lactic Acid	0.02
Ethyl Alcohol	0.2
Aq. dist. q.s.	2 mils

The injection is made in the first or second lumbar interspace, with the withdrawal and re-injection of a small amount of spinal fluid.

Results have amply warranted our confidence in the combined method.

THE EVALUATION OF METHODS IN OBSTETRICAL ANALGESIA AND ANÆSTHESIA: WITH SPECIAL REFERENCE TO GAS-OXYGEN.

By Carl Henry Davis, M.D., F.A.C.S., Milwaukee.

Summary.

The woman in labour is entitled to the maximum relief of pain which is possible without sacrificing safety. With methods now in use there is no longer any excuse for the old-time sound-proof crying room and the delivery room is no longer a chamber of horrors. Formerly the out-cries of obstetrical patients made the nights hideous for everyone in a hospital, but to-day most women may be carried through labour with few moans and no out-cries. Attention to pain relief does not require more nursing or medical attention than is necessary for the safe conduct of labour.

The obstetrician must be familiar with all methods of pain relief and adapt them to the needs of the patient during the different stages of labour. Standardization is impracticable except in so far as a general plan may be followed. The writer has experimented with most methods of pain relief and as the result of animal experiments and clinical experience has adopted the following plan for his private patients.

First stage pain is relieved by hypodermic medication, occasionally supplemented by colonic ether-oil. Heroin grs. 1/12 or pantopon grs. 1/3 and hyoscin grs. 1/100 is prepared

in the syringe. The patient is told that she may have a hypodermic at any time she may wish it because of painful contractions. When she begins to complain a rectal examination is made to determine the degree of dilatation. If early in labour with little dilatation, pains moderate and contractions short, only half of the dose is injected, the rest being given when needed. A severe labour requires the full dose at one time. Colonic ether-oil is limited to the patients who have a tetanic type of contraction or an unusually painful first stage with slow dilatation of the cervix. Ether-oil is contraindicated if the patient has kidney disease or a history of an irritable colon or colitis. In long labours additional hypodermic medication is frequently needed, and reduced doses such as heroin grs. 1/24 or pantopon grs. 1/6, and hyoscin grs. 1/300 may be administered. An attempt is made to avoid hypodermic medication during the last two hours of labour. Hypodermic medication may also be used during the night to give sleep to patients who may not have much pain but who are being kept awake by the constantly recurring uterine contractions. This tends to conserve strength and lessens the tendency to exhaustion late in labour.

Near the end of the first stage or early in the second stage of labour the patient is taken to the delivery room and intermittent gas-oxygen analgesia used as needed to control pain. Many patients only require gas for a few minutes during the perineal stage. Either nitrous oxid-oxygen or ethylene-oxygen may be used. For the second stage analgesia ethylene appears to have some advantages over nitrous oxide. It is the more powerful anæsthetic and may be administered with a higher percentage of oxygen. Both gases undoubtedly reduce the oxygen carrying power of the blood. During the past two years 580 patients at Columbia Hospital have had ethylene-oxygen for delivery. The average time of administration was 63 minutes and the average cost to the patient $12.00 (£2 8s 0d).

Gas oxygen is satisfactory for most operative deliveries except those requiring a considerable degree of relaxation, such as version. For these ether may be added to the mixture but it is rarely needed when ethylene-oxygen is employed.

Cæsarean section may be performed with local anæsthesia, combined anæsthesia or with ethylene-oxygen. Caudal anæsthesia or sacral nerve block is advised for severe pulmonary, cardiac and renal complications, with or without toxæmia.

Discussion

Dr. Long: It has been said there are four generally accepted methods of analgesia; three of them have been covered in this afternoon's symposium. The one left untouched in this series is the latter-day morphine semi-narcosis. If that newspaper campaign on twilight sleep some fifteen or sixteen years ago, carried on in the modern up-to-date style, was permitted, and it is generally agreed it was, it had one good later effect. It got the women to demand some sort of relief and put the obstetricians on their toes to help find it. It is absolutely true that the field of progress made in the field of obstetrical analgesia can be referred back to that popular magazine called *Twilight Sleep*. It was read by every woman in the United States. Anæsthetists and obstetricians working together on this subject have accomplished a good deal. There is a field for each of these techniques and we should select that one most adaptable to the case in hand at the time. Naturally, I see more of the results of ethylene analgesia than any other kind. I am especially fond of watching the effect of gas analgesia. I am impressed with the nicety and accuracy with which you can control the expulsive stage. Permitting of that ideal of modern anæsthesia and the delivery of the head I have, with ethylene particularly, held patients at the place where one more pain would certainly deliver the head, for 25 or 30 minutes, not permitting that last pain to occur. Some maintain there is danger to the child in that delay. It is nice to know that nowadays, as Dr. Davis has said, there is no excuse for the outcry of the obstetrical patient. We should never hear it again. It ought to be a disgrace for anyone to hear the outcry of agony. There will always be some women who cannot get assistance, and some who won't have assistance, but those who do call for assistance should, in this day and age, be able to be free from pain.

Dr. Harding: Generally using ethylene and air,, I give 25 per cent. ethylene and 75 per cent. air. I think Dr. Clark reported 2,500 cases in the Journal at a cost of about $1.00 a patient for gas. We use 25 per cent. ethylene and 75 per cent. of air, and we give that until the child's head is down, if the obstetrician wants complete relaxation or the pain is abolished. The patients have no recollection of any pain whatever. They are not conscious of it but they have pain; they help themselves just as though they had no anæsthetic at all. We have used and given it in all cases of pulmonary tuberculosis. We happen to be located within a few miles of a tuberculosis

sanitorium and such cases are referred to us. In obstetrics, however, they confine us to ethylene and we give it in all cases regardless of pulmonary findings or kidney complications, with beautiful results. The patients are happy over the results and rather look forward to being confined afterwards.

Dr. RUTH: Referring to Dr. Oldham's paper, I have had probably one hundred such cases and I have noticed some marked reactions immediately after the injections. It has not been due to excessive toxicity of the solution; it has not been due to lack of care; but, nevertheless, we have had some marked reactions: one which I have seen more than any other has been the circulatory reaction, the patient being cold and clammy. In one instance, I remember a man in excellent health who, for a period of ten or fifteen minutes after injection had an absolute loss of orientation—he could not recognize anyone for ten or fifteen minutes. As regards the circulatory action in his case I have not been able to find anything to explain it. I would like to ask Dr. Oldham if he has had anything of that nature.

A VOICE: Has Dr. Oldham found any danger of permanent loss of sleep? Has he had any indication of anything bordering on collapse following injection?

Dr. NOYES: I would like to ask Dr. Oldham about the position of the patient during the injection. I had an idea in most surgical cases an attempt was made to place the patient on the abdomen. In obstetrical cases that is a very uncomfortable position. We place them on the side. I was also wondering whether there was any effect on the bladder control; also if the percentage of forceps would be increased in these cases.

I want to ask Dr. Davis what percenatge of gas oxygen for analgesia is considered to-day, the best mixture, or must that be varied from time to time, according to conditions. The question was asked about type of quinine used. During part of the time, in the earlier cases, I used quinine hydro-bromide and with that I naturally used more alkaloid; latterly, I used the quinine alkaloid. I talked with the pharmacist at the New York Lying-In Hospital and he said that the reports that he got from people doing work in the wards was that there was a greater amount of neuritis coming from the rectum within the next few days after the alkaloid quinine had been used. I gathered from what he said that the alkaloid was a little more irritating to the wall.

Dr. OLDHAM: The question was asked in regard to the effect of cocaine and quinine. I have never noticed any bad effect. I can see that in using a needle excessively long you may get some of the solution into the spinal fluid. I am always looking for blood pressure,—that is taken between the time of injection and the time

of the anæsthetic. Of course, it would be better to lay the patients on the abdomen, but sometimes I place them on the side; in that position it is easy to get into the small canal. Sometimes it is pretty hard to get into the small canal. Someone asked about the paralysis of the rectum. You may get that. However, it is only a matter of a few days duration and comes back to normal.

Dr. ASTLEY: Inquiry has been made regarding the appearance of any indication of collapse. In the use of spinal anæsthetics there is reduction in blood pressure; because of this we use a fluid that is lighter than the cerebral. Because of the tendency of the fluid to float upward we promptly get our patient down on the table. The anæsthetist, as soon as he takes his needle out, must lower the patient in a head-low position. By getting our patient down promptly in these high pressure cases—the toxic cases—we haven't seen a dangerous fall in blood pressure. Occasionally you will get an unusual fall in blood pressure. Occasionally the pressure may not be recorded and yet your patient is breathing perfectly freely.

Dr. DAVIS: Dr. Noyes asks regarding the percentage. I do not believe we should ever attempt to have a fixed percentage. We have to change that with the patient and with conditions as they develop. You may have a general percentage that you start out with, but you should always depend on conditions. Re the question regarding ethylene used in pulmonary-cardiac complications. I have personally had no experience with cardiac anæsthesia, but if I do, I will probably use oxygen as much as possible.

Dr. MCMECHAN: On the subject of the use of gum glucose and gum in the treatment of shock, the observation was made that gum secured from different sources might produce rather a disagreeable reaction. I wanted to ask whether, in your experience, Dr. Driscoll, in using the gum glucose solution, you encountered any particular reaction due to the gum which you used?

Dr. DRISCOLL: We did not. We have been using a preparation made by Swift. We have had no bad results except in one case. The gum is given at the rate of every three or four minutes. We have had no bad effects but in this particular instance we had bad results but I do not think it was due to the action of the gum.

(Demonstration by Dr. AXLEROD of Cleveland, Ohio, of apparatus for driving ethylene fumes from the operating room.)

ADJOURNED.

Tuesday, May 17, 1927, 8 p.m. Dinner-Dance at which Dr. WM. HAMILTON LONG made address on "Putting Anæsthesia Across in Dixie."

A delegation of the American Medical Association, headed by Dr. Charles H. Mayo, placed a wreath upon the statue of Dr. Crawford W. Long, in the Rotunda of the Capitol, at Washington. Among those present was the surviving daughter of Dr. Long, Mrs. Frances Long Taylor.

"PUTTING ANÆSTHESIA ACROSS IN DIXIE"

Wm Hamilton Long, Louisville, Ky.

Summary.

The presentation of a loving-cup to Dr. Wm. Hamilton Long, was the feature of the Annual Dinner Dance. In presenting it with the appreciation of the Associated Anæsthetists and the International Anæsthesia Research Society, Dr. McMechan recalled the fact that Dr. Long had acted as organization president of the Interstate (now the Mid-Western) Anæsthetists in 1915-16, as well as organization secretary of the Southern Anæsthetists in 1922-23. Since then, what had been acomplished in the organization of the specialty, fostering research, advancing teaching and perfecting hospital anæsthesia service, had been due to the activities of Dr. Long.

He had done a splendid lot of work and his associates were proud of him and very grateful for bringing the ideals of Dr. Crawford Wm. Long, for painless surgery, into realization. It was very fitting that Dr. Long should have been selected to give the tribute to Crawford Long for the Southern Anæsthetists when his statue was unveiled in the Congressional Hall of fame; and it was even a more beautiful compensation that Crawford Long's surviving daughter, Mrs. Frances Long Taylor, should be present to see the presentation of the cup.

In replying, Dr. Long said he felt utterly unworthy of the honour that was being bestowed upon him, but that he accepted the cup in the spirit in which it had been presented, and would try to earn the right to its possession by his achievements for anæsthesia in the future. He made a stirring plea for co-operation among the anæsthetists and the several organizations "to put anæsthesia across" in a big way, and felt it a proud privilege to have been in secretarial charge of the destinies of the Southern Anæsthetists since its beginning as an association and during the first six years of its existence. He hoped he might be spared to the work until anæsthesia in his beloved Dixie had finally come into its kingdom around the corner and would be recognized alike

in its value and surcease from sufferng, by the public and profession alike.

POST-OPERATIVE DISTENSION.

By E. B. Benedict, M.D., Boston.

Summary.

It is well known that air may be swallowed during the early stages of anæsthetization. In three of the cases observed, 115, 67 and 54 swallowing movements, respectively, were observed. Again, it is a matter of common observation that great dryness of the mucous membrane of the mouth and pharynx is one of the after-effects of ether, and that many patients make an effort to relieve this by swallowing motions which carry air into the stomach. It was also observed that many of our patients, following operation, complained of gas in the stomach, which they often attempted to relieve by belching, and undoubtedly more air was swallowed in an attempt to relieve the gastric distress. Air thus swallowed may be passed from the stomach into the intestine as we have demonstrated in other experiments. Inasmuch as analyses showed always a high percentage of nitrogen it seemed reasonable to try a small stomach tube as a means of treatment. Accordingly, while the patient was still under ether, a small stomach tube was passed through the nose and the gaseous content of the stomach drawn off. The tube was left in place for a day or more and gaseous contents aspirated twice daily. Incidence of post-operative distention was much reduced by this procedure—only one patient in eight distended, as against one in three without the stomach tube.

Air swallowed during anæsthesia may be passed into the intestine and, owing to its high N_2 content and slow rate of diffusion, may be an important factor in post-operative distension.

In the treatment of such cases the small stomach tube has been shown to be of great value.

CLINICAL OBSERVATIONS ON ANÆSTHESIA FOR GOITER SURGERY.

By Marie B. Kast, Indianapolis, Indiana.

Summary.

Anæsthesia for goiter surgery is both fascinating and interesting because it presents factors for consideration which are not only peculiar to it, but which are not encountered in any other type of surgery; and this knowledge is essential to the anæsthetist for a proper appreciation of its importance.

The severer the degree of toxæmia, the more pronounced the disturbed nervous balance. Aside from psychic reassurance and allaying fear, all examinations should be made under the guise of a friendly visit in the patient's room. Hypnotics should be used freely, and morphine as a preliminary narcotic, as well as to reduce excessive metabolism. We do not favour the addition of either atropin or hyoscin.

Anæsthesia is usually induced in the patient's room, although most patients are really aware of what is going on in trying to "steal the thyroid." The tachycardia of goiter is quite a consistent evidence of the degree and duration of toxæmia, and the extent of heart damage from oxygen need and increased heart load. With rest, iodin and digitilization, toxic goiter patients improve to the operable stage for ligation or lobectomy or bilateral resection—preferably under local anæsthesia. If an accelleration of pulse rate does not subside after general anæshesia is induced, or the rate shows a tendency to ascend, it is a strong indication that the patient is a hazardous operative risk.

The anæsthetist must be prepared to deal with pressure symptoms, from cough to obstructed breathing, as well as the incidence of tracheal collapse, tracheotomy or intubation or gases under pressure. Dividing the isthmus as an early operative step, is helpful in avoiding these complications.

Secondary œdema from tissue trauma or pressure and hæmorrhage are occasional complications that must be watched for and guarded against.

For the milder toxic cases and simple enlargement of the lobes, gas-oxygen anæsthesia is ideal either with nitrous oxide or ethylene. Light ether, with nitrous oxide or ethyl

chlorid induction is a favourite routine, and results compare very favourably with those following gas-oxygen anæsthesia.

We have also used ether-oil colonic anæsthesia (Gwathmey) for my apprehensive patients with excellent results. Surgical anæsthesia is easily induced and maintained with this method and the plane of anæsthesia is completely under control of the anæsthetist at all times. None of our cases showed evidence of over dosage; and consciousness returns long before sensation to pain, which is a real advantage. Local anæsthesia by infiltration is preferably used for ligation and lobectomy.

EFFECTS OF VARIOUS ANÆSTHETICS ON HEPATIC FUNCTION.

By Sanford M. Rosenthal *and* Wesley Bourne, Montreal.

Summary.

The effects of anæsthesia on the liver may play an important rôle in the recovery or death of operated patients, hence the clinical significance of a study of bile pigment disturbances and hepatic function in this connection.

The bilirubin in the blood was estimated by comparing the diluted serum with a 1 to 10,000 solution of potassium bichromate (Meulingratsch).

The highest dilution of urine which gives a reddish colour with Ehrlich's thiozobenzaldehyde reagent was taken as the end point, and in normal dose on a mixed diet the dilution index ranges from five to ten (Wallace and Diamond).

Normally, the liver can remove bromsulphalein, after intravenous injection, 5 mgm. perkilo of bodyweight, within 15 minutes. Pathology and systemic diseases which inhibit liver function delay excretion of dye. The dye is estimated colourimetrically in samples of the serum or plasma withdrawn at 5, 10, 15 minute and longer intervals.

Chloroform poisoning is not due merely to hypersusceptibility or over dosage; the studies of Rosenthal and Bourne show chloroform poisoning to be synonymous with chloroform anæsthesia and that the delayed effects are of much longer duration than has previously been thought.

One half hour of chloroform anæsthesia produces a transient bilirubinæmia or urobilinogenuria that returns to normal in three days. The bromsulphalein test shows dye retention for eight days.

With two hours of chloroform the icterus index rises to 11 on the following day and requires ten days to return to normal. The urobilinogen index rises from 5 to 100 and returns to normal in the same periods of time. The bromsulphalein test shows 100 per cent retention for the first two days and requires six weeks for recovery.

The dye test is so sensitive that it may reveal impaired function in chronic liver disease when the pigment determination shows normal values.

There is an immediate depression following chloroform anæsthesia, more marked than with ether, but the greatest damage is 24 hours after, which is in accord with Whipple's pathologcal findings.

The bromsulphalein test shows lowered kidney function following ether anæsthesia, but with ether the liver function has returned to normal by the next day.

In striking contrast to chloroform and ether, one to two hours of gas-oxygen anæsthesia (nitrous oxide and ethylene) *without* cyanosis, caused no immediate or delayed impairment of liver function as determined by the dye test and the blood bilirubin.

With cyanosis during gas-oxygen anæsthesia, liver function and blood bilirubin were markedly affected and were two to three days in returning to normal.

Ether with excess CO_2 showed impaired liver function more markedly than ether with oxygen.

Morphin, 10 mgm. per kilo of weight, was followed by as marked lowering of liver function as chloroform, but with a return to normal by the following day. Even with the cyanosis of morphin offset by oxygen, the dye test showed the same degree of lowered liver function. Dogs are so resistant to morphin that this dosage is no criterion for man, and the doses of morphin used in clinical anæsthesia would impair liver function very slightly, if at all.

SOME PRACTICAL SUGGESTIONS CONCERNING THE USE OF ALKOFORM AS AN ANÆSTHETIC AGENT.

By C. W. HARNED, Des Moines, Iowa.

SUMMARY.

ALKOFORM, being converted into a nebulous vapour and conveyed to the patient in a dry gaseous state, involves a technique materially different than the usual method of giving chloroform or ether. Alkoform is a mixture of alcohol 1, chloroform 2 and ether 3 parts, to which enough additional ether is added to make the specific gravity that of distilled water at 70°F.

My attention was drawn to alkoform in 1914 when it was used for me by Dr. Hinkle, through the tracheal tube for a patient 72 years of age, operated on for a carcinoma of the back of the tongue, with excellent recovery.

To overcome the difference in volatility of the three agents in the mixture, alkoform is broken into a fine dry vapour by means of a current of air into the nebulizing chamber. The nebulized vapour passes into a rubber bag and is drawn from this reservoir by the patient in sufficient quantities to meet the demands of natural respiratory efforts. The vapour reaches the mouth at operating room temperature.

The depth of anæsthesia is controlled entirely by the dilution of the vapour with air, and is increased or decreased at the will of the anæsthetist.

Even during prolonged tracheal administration (for two to five hours) without oxygen or CO_2, respiration, pulse rate and blood pressures remained almost normal and the blood a bright red colour.

Check valves prevent rebreathing, and the supply bag is best kept fairly well filled so that respiration is never hampered or restricted. While the apparatus makes the method look like a closed-up, the amount of air used as a vehicle for the low concentrations of nebulized vapour is greater than is inhaled from a gauze ether mask. Alkoform does not stimulate the secretion of mucus and it is easy to keep an open airway.

From the surgeon's viewpoint, chloroform and ether still remain the anæsthetics of choice, and alkoform is a mixture

that admits of simple administration, relaxing anæsthesia within safe limitations and reduces the anæsthetic effects on the lungs, heart, liver and kidneys to a minimum and does not seriously affect the acid-base balance. The average amount of alkoform for an adult is 1¼ ounces per hour. After surgical anæsthesia has been induced very little alkoform is required to maintain anæsthesia. Recovery is comparatively rapid and there is little or no nausea or vomiting.

An ounce of alkoform is usually sufficient to provide analgesia in obstetrics for two to three hours. The analgesia is very effective and satisfactory and can readily be deepened to anæsthesia for forceps delivery, repair or operative obstetrics.

THE PHARMACOLOGICAL ACTION AND ADMINISTRATION OF NEBULIZED ANÆSTHETIC VAPOURS.

By J. G. E. Hinkle, Bethany, Wis.

ABSTRACT.

After years of effort in perfecting a device that would satisfactorily neutralize anæsthetic vapours and also in the clinical and experimental use of many combinations of anæsthetics, the Hinkle apparatus and alkoform (alcohol 1, chloroform 2 and ether 3 parts, with just enough more ether to bring the specific graviy of the mixture to 1, the same as distilled water), has been the result.

That alkoform is a mixture in its pharmocological and physiological effects may be seen in the fact that following its use, the exhaled air, blood and urine of experimental animals give positive tests for the presence of free alcohol and chloroform.

The diluted vapour of alkoform acts somewhat like acetylene or ethylene with a noticeably increased tone of the cardio-inhibitory centre in the medulla. Alkoform vapours cover the complete range of anæsthesia, from the mildest analgesia which it is possible to detect to the profoundest anæsthesia, respiratory depression and death.

It takes about five minutes to secure a saturation of alkoform in the blood and tissues sufficient for the anæsthetic effect. When the vapour is given regularly, in even concen-

tration and with ample air, blood pressure and respiration remain in excellent condition for two to three hours of administration to the experimental animal. Therein administration shows parallel response in respiratory and blood pressure reactions.

After half-an-hour of alkoform anæsthesia, the experimental dog recovers and is on his feet in 10 minutes. Lethal doses kill by paralyzing the respiratory centre. The heart continues beating for several moments after respiration ceases, and resuscitation by artificial respiration, heart massage and intravenous adrenalin are effective. Alkoform has a depressant action midway between that of ether and chloroform.

Alkoform vapour is more easily breathed and less irritating than ether. Induction is rapid and pleasant and recovery without much nausea or vomiting. In some 3000 experimental administrations of alkoform, cardiac fibrillation has not occurred. Ordinarily air suffices as a vehicle for alkoform, but emergencies are more easily met if oxygen is used. So far as experiment has been able to determine, the injection of adrenalin does not cause the typical reaction with alkoform that occurs with chloroform alone.

LABORATORY AIDS IN THE PREPARATION AND AFTER-CARE OF SURGICAL PATIENTS.

By Wm. Thalhimer, Director, Laboratory of Pathology, Columbia Hospital, Milwaukee, Wis.

Abstract.

One of the oldest and most reliable laboratory methods, that of blood counting, gives evidence which is most useful, and which is very often neglected. Anæmia is a serious handicap to a patient, and is easily and immediately removed by one or more transfusions. A plea is made for the use of more transfusions than is the custom to-day. Recent results showing that, just as with ether, both nitrous oxide-oxygen and ethylene-oxygen anesthesias reduce the oxygen carrying power of the blood are mentioned. This effect of the anæsthetics further increases the seriousness of anæmia.

The importance of both acidosis and alkalosis is commented upon. Acidosis can easily be combated and usually

be prevented. Post-operative acidosis after ethylene anæsthesia is a rarity nowadays. In intestinal obstruction, either functional or organic, alkalosis often occurs, and the blood chlorides are always lowered and the blood N.P.N. always raised. These blood findings always indicate an obstruction of some sort. The patient's condition can be very much improved, and at times his life can be saved by the intravenous administration of large amounts of salt at frequent intervals, as indicated by the level of the blood chlorides. It is not known even to-day whether most patients who die from peritonitis succumb because of peritoneal infection or because of ileus. The latter factor is certainly a very considerable one. The lives of many patients with peritonitis can be prolonged by the injection of salt solution, and it can be presumed that in this additional interval some patients who would ordinarily die will recover.

A COMPARISON BETWEEN THE POST-OPERATIVE COMPLICATIONS AFTER ETHER AND NITROUS OXIDE ANÆSTHESIA IN 5,000 CASES.

By A. H. Miller, Providence, R.I.

Summary.

To answer a physician's question regarding his chances for developing certain circulatory and pulmonary complications after operation, the results following 1,493 nitrous oxide-oxygen anæsthesias and 3,501 etherizations were tabulated and studied in this connection.

	Circulatory Complications		Mortality	
	G.O.	Ether	G.O.	Ether
	%	%	%	%
Phlebitis	.60	.65	.0	.0
Coronary Embolism ...	.20	.09	.20	.09
Cerebral ,, ...	.20	.03	.20	.03
Pulmonary ,, ...	.33	.20	.20	.09
Mesenteric ,, ...	—	.06	—	.06
Cerebral Hæmorrhage ...	.20	.03	.03	.03
	1.53	1.06	.80	.30

			Pulmonary			
			%	%	%	%
Pneumonia	...	...	.66	.54	.13	.17
Bronchitis	..	...	.135	.26	—	—
Pleurisy	... ...	...	.135	.11	—	—
Pulmonary Abscess		...	.135	.03	—	—
Pulmonary Œdema		...	.135	—	.135	—
			1.20	.94	.265	.17

	Nausea and Vomiting	
	G.O.	Ether
	%	%
Excessive ...	4.6	5.3
Slight ...	15.6	45.0
None ...	80.4	49.7

The majority of surgical patients are not in the best physical condition, but are debilitated by suffering, toxæmia, cachexia and some degree of septicæmia. Embolism affects people in their ordinary lives, so it is not surprising that embolism, as a post-operative complication, may anticipate by only a few days or weeks, a natural outcome of the patient's condition.

Anæsthetics may favourably influence such conditions as coryza, bronchial asthma (ether) and even pneumonia (gas-oxygen). The real relation of anæsthetics to post-operative complications is diffcult to decide. While in the present tabulation, both pulmonary and circulatory complications occurred more often after gas-oxygen than after ether, if the tabulation had been extended to include nephritis and diabetes, the record would have seemed even more unfavourable to nitrous oxide; but gas-oxygen was given to all patients with known nephritis and diabetes as the anæsthetic of choice. Uremia and diabetic coma followed etherization only in cases in which nephritis and diabetes had not been diagnosed before operation.

In patients *predisposed* to certain conditions, no known anæsthetic seems capable, as yet, of preventing all post-operative complications.

THE EFFECT OF INHALATION ANÆSTHESIA UPON INTRACRANIAL PRESSURE.

By K. Winfield Ney, M.D., New York City.

Abstract.

The rigid cranial cavity and bony spinal canal lined by an inelastic dura constitutes the container of the central nervous system, which is incapable of expansion to accommodate increases of intracranial pressure. The cerebrospinal fluid is the great pressure adjustment media. By virtue of its rapid absorption and secretion, it is capable of making adequate adjustments to increases of intracranial pressure up to a certain point, after which its compensation possibilities are exhausted and the cerebral circulation becomes impaired. In hydrocephalus, where there is a block in the cerebrospinal fluid circulating channels, and in large brain tumours where the cerebrospinal fluid has been crowded from the cranial chambers, any further increase of intracranial pressure is apt to be a serious eventuality, in that displacement of the cerebrospinal fluid to accommodate changes in intracranial pressure is no longer possible.

Ney, during a series of ventricular examinations in epilepsies under general anæsthesa, measured intracranial pressure and often found it to be elevated from 20 to 30 mm.Hg. Being unable to account for the marked increase of intracranial pressure, he later, under local anæsthesia, measured the intraventricular pressure in some of the same series and found a hypotension,—pressures under 6 mm.Hg., which is characteristic of certain types of advanced epilepsy. As a result of such experiences he concluded that there is a marked increase of intracranial pressure attending inhalation anæsthesia, which is common to chloroform, ether and most marked with nitrous oxide.

When a brain needle is passed into the ventricle, a mercurial manometer is immediately attached, and pressure readings made. The normal pressure, under local anæsthesia with the patient's mouth open, is approximately 8 mm. Hg. When one jugular is compressed, intraventricular pressure is elevated to 16 mm.Hg.; with the compression of both jugulars, to approximately 24 mm.Hg. When this pressure is maintained, there is a still further increase of intraventricular

pressure, which represents the general intracranial pressure. In inhalation anæsthesia, particularly when there is straining, the return circulation from the jugular veins is inhibited through an elevation of intra-thoracic pressure above venous pressure. This results in a venous stasis in the cerebral veins, which is probably responsible for the marked rise in intracranial pressure. In a smoothly given inhalation anæsthesia which is not attended with straining or vomiting, the rise in intracranial pressure is not so conspicuous, though there is a definite increase. When an inhalation anæsthesia, associated with straining and vomiting is given to a patient having a normal cerebrospinal fluid pressure adjustment mechanism, the increase in intracranial pressure is rapidly adjusted through displacement of cerebrospinal fluid. When, however, the adjustment mechanism is impaired, as it is in all increases of intracranial pressure, an inhalation anæsthesia is apt to be attended by a further elevation of pressure, with serious consequences to the patient.

In Ney's clinic, when local is not used alone, rectally administered oil-ether is combined with local in all intracranial operations except in very young children, where local anæsthesia is occasionally supplemented with a few drops of chloroform to control the patient. In head injuries, with cerebral hæmorrhage, an inhalation anæsthesia, by increasing intracranial pressure may promote further hæmorrhage, and in hydrocephalus and cerebral tumours, with impaired cerebral circulation, a further acute increase of intracranial pressure may be responsible for the rapid development of a serious cerebral œdema.

FURTHER EXPERIENCES WITH HELIUM-OXYGEN MIXTURES IN PRESSURE CHAMBERS.

By R. R. Sayres, Washington, D.C.

Summary.

The British Journal of Anæsthesia has already published a resumé of the experimental work along these lines on animals as reported to the Fourth Congress of Anæsthetists in Atlantic City, two years ago.

Sayres has carried his experiments out on human beings in pressure chambers, as well as in deep sea diving (in raising the wreck of the submarine off Boston) and has found his original conclusions correct, applicable to man, and of very practical use.

By substituting helium for nitrogen, compression and decompression may both be speeded up remarkably and the time limit of work under pressure thereby materially increased. There is also very little likelihood of precipitating the "bends" during decompression, and a helium-oxygen chamber is invaluable in the immediate treatment of this condition when it occurs, on account of the increased speed with which the patient may be recompressed. If ever certain surgical operations, especially on the lungs with a widely opened chest, are routinely done under pressure, helium-oxygen atmospheres will be an asset for all those working in the pressure chamber as well as the patient being operated upon.

FURTHER CLINICAL EXPERIENCES WITH ETHYLENE-OXYGEN ANÆSTHESIA.

By Isabella C. Herb, Chicago.

Summary.

After a clinical experience of over four years with ethylene oxygen anæsthesia, covering many thousands of administrations, I feel justified in reiterating my enthusiasm for its use, reported after my first 500 cases.

Excluding eye as well as nose and throat operations, ethylene-oxygen anæsthesia (occasionally with some ether) is given in about 70 per cent. of the operations at the Presbyterian Hospital, and Luckhardts' and Carter's contention that ethylene, when administered with enough oxygen is non-toxic during anæsthesia and produces no deleterious after-effects, has been borne out, especially in very septic patients, diabetes, and nephritis, as well as in patients with severe myocarditis, auricular fibrillation, valvular disease, aneurysm, arterio-sclerosis, high blood-pressure and respiratory infections. No changes of consequence have been noted in

the blood and tissue chemistry or organic functional activities. Even in the actively tuberculous ethylene-oxygen is the anæsthetic of choice, and quiescent lesions are not lighted up.

It produces ideal analgesia and anæsthesia for the second stage of labour, as it does not effect uterine contractions, even while providing relaxation; and enough oxygen may be given to obviate the necessity for resuscitation of the newborn babe. It is ideal for operative deliveries, forceps or Cæsarean sections.

In dentistry and oral surgery it provides a deeper and more lasting analgesia.

As ethylene does not abolish peristalsis, it may be necessary to add minimal amounts of ether to secure a silent abdomen or completer muscular relaxation. In certain upper abdominal operations ether is used after ethylene-oxygen for the more difficult parts of the surgery and after the closing of the parietal peritoneum, ethylene-oxygen is resumed. High percentages of oxygen are used toward the close of operations to help-eliminate any ether that has been given.

Induction is not hurried for the sake of speedy records, the comforts and morale of the patients are shown due consideration. The patient and the conditions of pathology and disease are the indexes governing the percentages of oxygen used and cyanosis is always avoided, even if ether is necessary to do so.

When cyanosis persists, obstruction to breathing, or mechanical deficiency of the apparatus, or impure ethylene must be thought of. The margin of safety with ethylene approaches the narrower limitations of nitrous oxide, but the freshly shed blood gives good evidence of whether oxygenation is sufficient or not. One hundred or 50 per cent. oxygen for two or three breaths, especially under slight pressure, will give resuscitation for ethylene overdose.

The signs of anæsthesia closely parallel those of nitrous oxide. The most desirable condition is when the lid is relaxed and the eyeball slowly oscillates or is stationary with the pupil looking straight forward. If the eyeball is turned and fixed, chronic muscular spasm will develop, and unless more oxygen is given death may result from asphyxia.

Ethylene kills like nitrous oxide or suffocation, as on post-mortem the right heart is found full of blood while the left heart is empty.

Anæsthesia develops very rapidly in children and they also require proportionately more oxygen.

On account of its low boiling point (−157°F.,), ethylene is rapidly eliminated and recovered from, and an analgesia of a few moments continues during return of consciousness. Ethylene-oxygen alone provides fairly good relaxation, and with ether, in six to twelve minutes from induction gives relaxation for any abdominal intervention.

While respiration may be variable during induction, it becomes rhythmical and machine-like during the third stage, and only becomes irregular again from obstruction, too little oxygen or surgical manipulations. Cyanosis or an ashen colour and forced expiration are danger signals.

Of itself, ethylene does not produce shock nor will it prevent shock, although like nitrous oxide it tends to stabilize bood pressures and pulse rate for several hours, even during major surgery.

Provided anæsthesia is guided by the movements of the eyeball rather than the pupil, morphine may be given as a preliminary narcotic. Sweating is absent under ethylene-oxygen unless nausea and vomiting occurs.

Except with one brand of ethylene, freezing takes place, especially when the cylinder is full. This disadvantage can be controlled by the use of a hot water bag over the reducing valve.

The odour of ethylene is now much better and 40 to 50 per cent. oxygen with the first few breaths almost entirely masks any remaining odour unnoticeable.

Vomiting still occurs too frequently with ethylene and is associated with the first portion of all or certain other tanks of gas, although chemical analysis shows no reason why. Shallow respiration, perspiration and swallowing precede the onset of vomiting. More or less oxygen to lighten or deepen anæsthesia and sometimes ether are indicated for control. There is more vomiting with ethylene than nitrous oxide, but less than with ether.

Ethylene is both inflammable and explosive and should not be given in the presence of an open flame, actual

cautery or any sort of electrical apparatus capable of producing a spark. Explosions due to static conditions can be controlled by investigating all sources of static and proper grounding.

SURGERY AND ANÆSTHESIA OF THE TUBERCULOUS.

Dr. F. Webb Griffith, Asheville, N.C.

Summary.

The general anæsthetics most commonly used are ether, nitros oxide and ethylene. Because of the strong prejudice which had existed for so long against the use of ether in tuberculous cases, I for many years tried to do abdominal operations with the use of nitrous oxide. The anæsthesia in these cases left much to be desired. The patients were usually "almost relaxed," one minute the muscles being too rigid to admit satisfactory work and the next minute the patient too deeply anæsthetised for safety. The risk of hæmorrhage, the numerous complications resulting from poor exposure, a feeling of incompleteness in performing the operation and the inability to examine the rest of the abdomen, caused me to give up nirous oxide entirely in abdominal surgery. The discovery of ethylene was a distinct advance. The advantages of that anæsthetic, the quickness of the recovery, the lack of nausea, etc., are all known to every one of you.

There are, however, numerous intra-abdominal lesions which, to be safely handled, require more thorough and complete relaxation than I have been able to obtain with the use of ethylene. I refer to most gall bladder operations, especially work upon the common duct; to the firmly impacted myomata of the uterus; to the densely adherent chronic pelvic inflammatory cases, and many others. Granting for the sake of argument, that ether is harmful, or, at least, potentially harmful to the lungs, the complete relaxation, with its resulting better exposure, lessened danger of hæmorrhage, the lessened risk of injuring important structures, and the saving of time in operating because of the better exposure, would still make it the anæsthetic of choice. But *is* ether any more

harmful to the tuberculous lung than to the non-tuberculous? Have we any proof to that effect? Is not our fear based upon the theory than ether is irritating to the lungs and therefore must be still more irritating to the tuberculous lung? Also we fear it because we were so taught as medical students. It has only been a few years since the term "ether pneumonia" was used to designate the pneumonia which sometimes followed an operation in which ether was the anæsthetic. When it was later shown that following certain operations under local anæsthesia the incidence of pneumonia was just as high as with ether, it was realized that probably the ether had very little to do with the pneumonia, and the term "ether pneumonia" was dropped and "post-operative pneumonia" substituted.

Having felt for sometime that the effect of ether on the lungs was greatly exaggerated, I carefully watched a long series of operations upon tuberculous patients in which ether was used. Every possible safeguard such as hot water bottles during operation, avoidance of draughts in transporting back to the room, careful watching during recovery from anæsthesia, early restoration of feeding, etc., were observed, just as in other poor risks. These cases all were referred from recognized lung specialists who had careful records of the pre-operative lung conditions and to whom the patients were returned after leaving the hospital. In some cases there was slight increase of cough for a few days, and in a few cases possibly slight congestion in the lungs. There were no cases of post-operative pneumonia.

The physical signs, pulse and temperature, of the tuberculous patient so frequently vary from month to month even under a fixed regime that following an operation we should be slow to attribute any slight changes, favourable and unfavourable to that operation. It is only when these changes are marked and persistent that the operation or anæsthetic could be held responsible.

In short, the check-up examinations by recognized chest men showed in no way any difference in those cases operated upon under ether from those operated upon under nitrous oxide or local anæsthesia.

I have, therefore, come to the conclusion that in operating

upon a patient with pulmonary tuberculosis we may choose local anæsthesia, ethylene or ether just as we would in any other poor risk and let the nature of the operation and the general condition of our patient be the criterion, rather than the fact that he has a focus of infection in the lung.

And while I allow myself great latitude in the selection of an anæsthetic in these cases, I absolutely insist upon having a careful, competent anæsthetist and all I have said above presupposes that the anæsthetic is administered by such a one. The occasional anæsthetist is just as dangerous as the occasional operator.

Other papers read are "Carbon Dioxide Filtration for General Analgesia and Anæsthesia" by Henry Thomson and D. E. Jackson; and "Anæsthesia Under Pressure" by E. I. McKesson. These will be dealt with in a later number.